



Agribusiness
& Economics
Research Unit
LINCOLN UNIVERSITY



The impacts of changes in agricultural policies in the United Kingdom on trade and agriculture especially in New Zealand – the WTO Option

John T. Saunders
Meike Guenther
Caroline Saunders

Discussion Research Report
September 2019

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**Agribusiness and Economics Research Unit
P O Box 85084
Lincoln University
Lincoln 7647
New Zealand**

Ph: (64) (3) 423 0372

<http://www.lincoln.ac.nz/AERU/>

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Chapter 1

Introduction

This report is part of a series of discussion documents on the impacts of changes in European Union (EU) policies that have the potential to affect New Zealand and how these can be discussed and communicated across a number of interested communities. This report is an initial analysis of what the possibilities are and the potential methods to assess this. Clearly, there are a number of further options which can be assessed especially as more detail is released on the future of EU and UK policy.

On June 23, 2016, the United Kingdom (UK) voted narrowly (52:48) to leave the EU. The UK government then officially notified the EU on March 29 2017, of its intention to leave, thus triggering Article 50 of the EU Treaty, which specifies that within two years the UK will cease to be a member. However, the date for Brexit is still unclear as EU leaders have granted the UK a six-month extension to Brexit until October 31, 2019. Consequently, the nature of the economic relationship between the UK and the remaining EU-27 is still to be defined.

Brexit will change the domestic and trade policies affecting agriculture in the UK and will have implications for agricultural commodity trade worldwide. The trade policy changes are key factors in determining the consequences of Brexit for agricultural markets in Europe and elsewhere. New Zealand (NZ) is a small open economy which is dependent on its agricultural exports. The UK is an important export market for NZ, especially for agricultural commodities. Since 1973, NZ's agricultural exports to the UK were subject to EU trade policy, hence, the UK exiting the EU will affect trade between the UK, the EU and third party countries like NZ.

Three possible alternatives to EU membership after Brexit are explored in the literature. (1) The Norway Option (i.e. UK remains in the Single Market); (2) the Swiss Option (i.e. bilateral agreements between the UK and EU); or (3) the WTO Option/ No Deal (i.e. UK - EU trade under World Trade Organisation terms). New trade relations will most likely be accompanied by increased trade transaction costs due to the introduction of tariffs and non-tariff measures. As a consequence of these changes to trade policy, there are likely to be significant factors affecting international agricultural trade and will have implications for the UK, the EU and other countries like NZ.

A few studies have assessed the potential effects of the UK exiting the EU on the UK agricultural sector using different scenarios and assumptions (Davis et al., 2017; Bellora et al., 2017; Jongeneel et al., 2016; Van Berkum et al., 2016; Sik Choi et al., 2019). However, there is a lack of research including the analysis of different trade policy options from Brexit and their impacts on other countries like NZ.

This study assessed how the agricultural sector of the UK, the EU and NZ would be affected if the UK would fall back to the WTO Default position leaving the EU without a deal on the 31st of October 2019. The analytical approach employs the Lincoln Trade and Environment Model (LTEM), a partial equilibrium model that forecasts international trade, production and consumption of agricultural commodities. A scenario was developed simulating the WTO/ No Deal option. Information gained from this study will assist NZ policy makers in identifying new opportunities for trade with the UK and showing the impact on the agricultural sector of NZ.

This report is structured as followed. The next chapter describes the NZ and UK trade relationship, including the UK's agricultural policy – the Common Agriculture Policy (CAP) - and its reforms. Then, Chapter 3 presents descriptions of three possible post-Brexit alternatives for UK-EU relations and summarises potential economic consequences; in particular the implications for agricultural trade between the EU and the UK post-Brexit. The chapter also reviews studies that analysed the potential economic impacts of a UK exit from the EU on the UK's economy and the agricultural sector, respectively. This is followed by a description of the modelling approach of this study and scenario development in Chapter 4. In Chapter 5, results will be described and discussed. The report finishes with a brief conclusion in Chapter 6.

Chapter 2

Agricultural trade

New Zealand and the UK have a long history of trading agricultural commodities. This was affected when the UK entered the European Community (EC) in 1973. The UK then adopted the Common Agricultural Policy (CAP) and became integrated into the common market. In this chapter, agricultural trade history and policies between NZ and the UK are described, followed by the agricultural trade history and policies between the UK and the EU.

2.1 Agricultural trade history of the UK and NZ

The NZ agricultural sector originally developed to service the UK market. This was enhanced by preferential agreements with the UK with the Ottawa agreement in 1933 and was followed by bulk purchase agreements during and immediately after the Second World War where the UK agreed to take all NZ agricultural exports for preferential prices. It is not surprising that around 90 per cent of exports from NZ went to the UK in 1950's. During the late 1950s and early 1960s there were some threats to NZ imports into the UK from other competitors but the response of the UK was again to offer some preferential access to NZ. However, the bulk purchase agreements ended in 1954 (Saunders, 2008).

However, over the 1960s it became clearer that the UK would enter the EC and that NZ trade would be seriously affected. In response, NZ began to diversify and by the time the UK entered the EC in 1973 exports to the UK had dropped to under 40 per cent. However, the UK was still an important market for NZ, especially for dairy and sheepmeat exports (Saunders, 2008).

Therefore, when the UK joined the EC and adopted the Common Agricultural Policy (CAP) (after a transitional period of five years), the threat to NZ trade was acute. The CAP was based upon fixed support prices with barriers to entry from third country imports. The EU, then called the EC, was established on 25 March 1957 when the Treaty of Rome was signed. The Common Agriculture Policy (CAP) was established in 1963 which effectively set internal minimum prices well above world market levels (Saunders, 2008). The EU CAP has moved a long way from the late 1970's and 1980's where its impact was harmful to NZ trade, not only in the loss of market access, particularly when the UK entered the EU, but also its subsidised exports onto world markets (Saunders, 2008). The change in the policy from its focus on support through encouraging production towards direct payments has been positive and is outlined in more detail in Section 2.2.

Since the UK joined the EU in 1973, it has not been an active member of WTO negotiations as all commitments were at the EU level. One of these commitments has been quantitative market access such as tariff rate quotas (TRQs). Currently, the UK has free movement of its agricultural goods within the EU. There are no tariffs or tariff quotas on the agricultural commodities traded between the UK and EU member states. In addition, being a part of the Customs Union, the UK has imposed the EU's common external tariff on goods imported into the UK from non-EU countries (Saunders et al., 2016).

The EU has tariffs on goods imported from non-EU countries. Tariffs on agricultural goods tend to be considerably higher than non-agricultural goods. For example, the average EU tariff on agricultural goods

was 10.7 per cent in 2015 compared with 4.2 per cent for non-agricultural goods. The average EU tariff on imported dairy products, sugars and confectionery were 35.5 per cent and 20.6 per cent, respectively (Potton & Webb, 2017).

Certain countries may pay lower or no tariffs to export their agricultural goods to the EU if they have a free trade agreement with the EU. EU Free Trade Agreements are currently in place with South Africa, Mexico, Chile and Korea. In addition, the EU has numerous preferential trade agreements. For example, Switzerland and the EU have a bilateral agreement on trade in processed agricultural products which has facilitated the liberalisation of their cheese sector. Switzerland pays zero tariffs on cheese exported to the EU. In addition, some developing countries, such as Turkey also have preferential access to the EU market with lower tariffs (Potton & Webb, 2017).

The EU has a system of tariff rate quotas (TRQs) which allow imports to come into the EU at a lower tariff rate up to a quota. There are 87 TRQ schemes for agricultural, food and beverage products which comprise more than 120 separate tariff quotas (Revell, 2017). Currently, the UK is included in the EU's TRQs schedules. The UK can import agricultural products from non-EU countries at lower, or zero, tariffs. Also, the EU export TRQs enable the UK to export agricultural goods to those countries at preferential or zero tariffs. In addition, the EU has preferential access for developing countries under the Generalised Scheme of Preferences (GSP). This removes import duties from products coming into the EU market (including UK) from developing countries (EC, 2019).

Agricultural trade is also subject also to a number of non-tariff barriers, which include Rules of Origin and Sanitary and Phytosanitary (SPS) standards relating to plant and animal health (Potton & Webb, 2017).

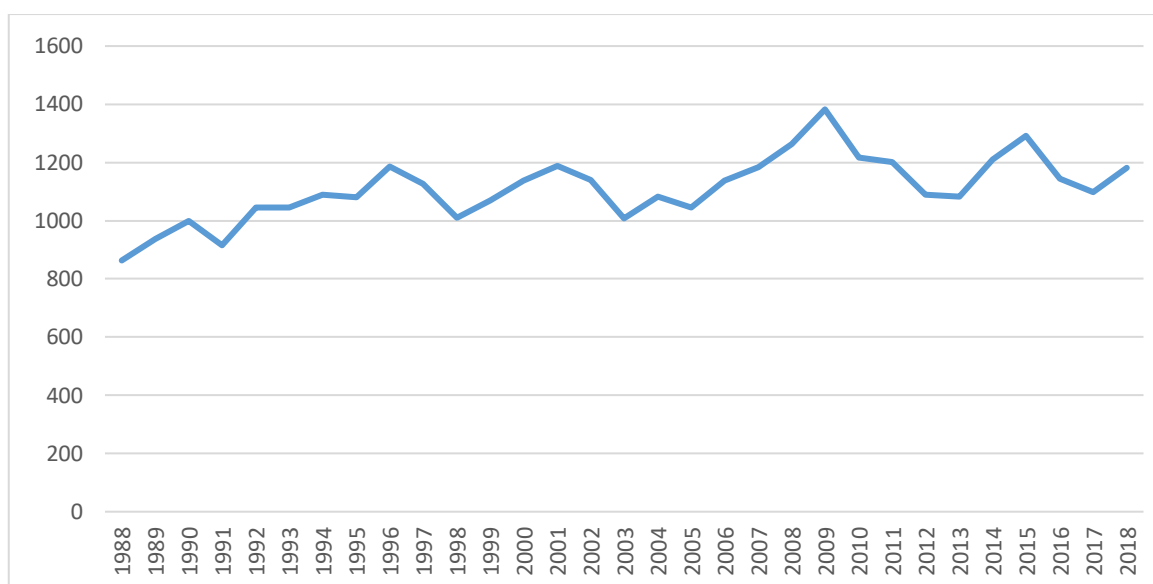
NZ's agricultural exports to the UK were subject to EU trade policy, after a transitional period, since the UK joined in 1973. NZ currently has country-specific TRQs for its beef (1,300t), sheepmeat (228,389t), cheese (11,000t) and butter (74,693t) exports to the EU market. These are particularly significant for sheepmeat. However, once the UK exits the EU, it can negotiate its own trade policies with third countries like NZ.

In recent years, the UK's historical position as NZ's key trading partner has decreased, however it remains an important market for NZ exporters and retains a position as NZ's eighth-largest trade partner in merchandise trade by total export value in 2018.

In 2018, the value of NZ agricultural exports to the UK was approximately NZ\$1.2 billion, comprising approximately 3.3 per cent of NZ's agricultural exports by value and representing NZ's fifth-largest export market for agricultural commodities. In particular, the UK was NZ's second-largest export market for sheep meat in 2018, valued at NZ\$473 million (12 per cent of total sheep meat exports by value). Similarly, the UK was also NZ's second-largest export market for wine, valued at NZ\$410 million in 2018 and accounted for almost a quarter of all wine exports (24 per cent). The UK was NZ's largest export market for apples, pears and quinces, valued at NZ\$79 million (10 per cent of total apple, pear and quince exports by value) and third-largest export market for wool, receiving 8 per cent of all NZ wool exports in 2018 (Statistics NZ, 2018b).

Over time, NZ agricultural exports into the UK have fluctuated, as shown in Figure 2-1.

Figure 2-1: Value of NZ agricultural exports into the UK, in NZ\$ million, 1988 – 2018.



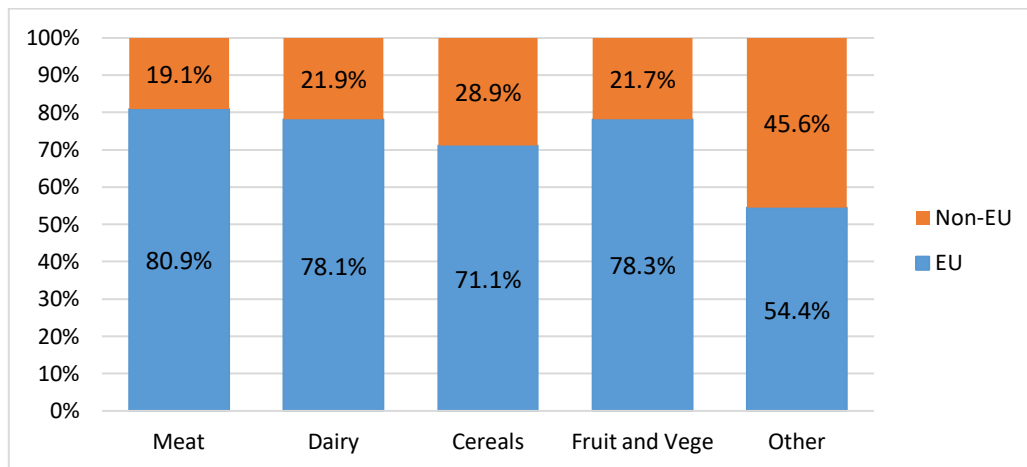
Source: Statistics NZ, (2018a).

For countries such as NZ, which is heavily dependent on agricultural exports, changes to policy and markets in the UK and EU have the potential to significantly affect the economy.

2.2 Agricultural trade of the EU and the UK

The agri-food sectors of the UK and EU have become highly integrated since the UK joined the EU in 1973. In 2018, 62 per cent of all UK agri-food exports went to the EU, at a value of approximately £13.9 billion. In particular, seven of the UK's ten largest export markets for agri-food products are EU member states (these are Irish Republic (1), France (2), Netherlands (4), Germany (5), Spain (6), Belgium (7) and Italy (9)), comprising approximately 52 per cent of total agri-food exports by value in 2018. Figure 2-2 shows that a high proportion of total UK agri-food commodities were exported to the EU in 2018. The EU is the UK's largest export market for all agricultural commodities, particularly for meat (81 per cent of total EU meat imports, valued at £1.52 billion), followed by fruit and vegetables (78 per cent of total EU fruit and vegetable imports, valued at £987 million), then cereals (78 per cent of total EU cereals imports, valued at £1.52 billion). This shows the importance of UK agri-food exports to the EU market.

Figure 2-2: UK agri-food exports, 2018 (percentage of total).

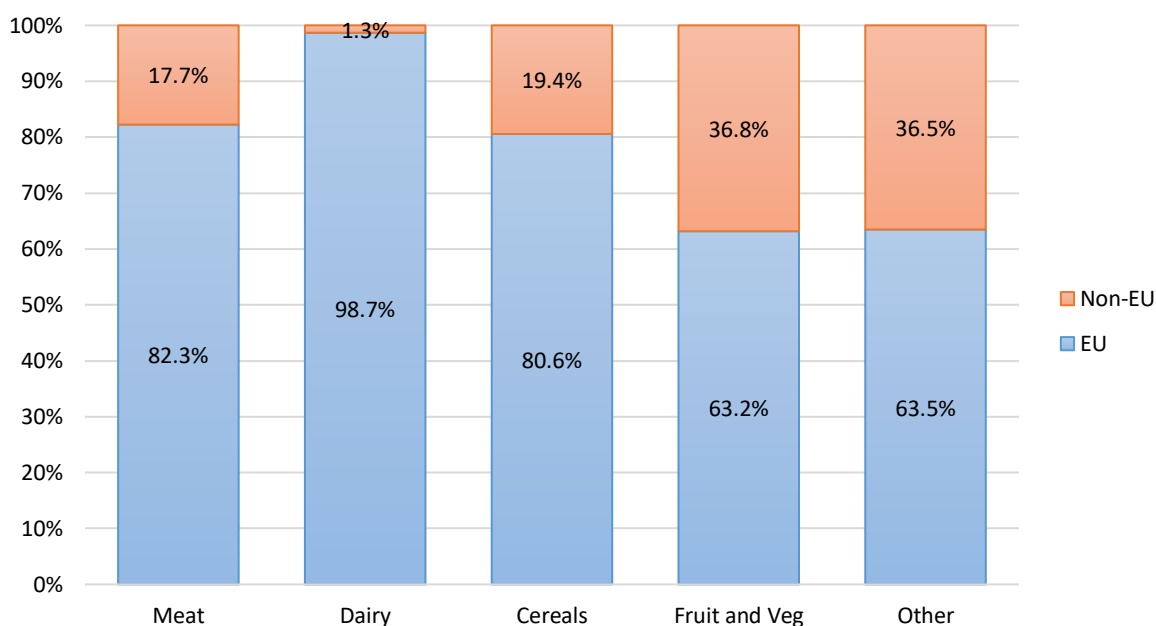


Source: Defra, (2019).

Similarly, the UK is reliant on imports of many agri-food commodities from the EU, with EU agri-food imports comprising approximately 70 per cent of total agri-food imports in 2018. In particular, nine of the UK's ten largest importers for agri-food products are EU member states (these are Netherlands (1), Irish Republic (2), France (3), Germany (4), Spain (5), Italy (6), Belgium (7), Poland (8) and Denmark (10),) comprising approximately 65 per cent of total agri-food imports to the UK by value in 2018 (Defra, 2019).

Figure 2-3 shows EU agri-food imports into the UK by commodity. Imports are particularly high for dairy (99 per cent of total dairy imports, valued at approximately £3.3 billion), meat (82 per cent of total meat imports, valued at approximately £5.6 billion), and cereals (81 per cent of total cereals imports, valued at approximately £7.0 billion) (Defra, 2019).

Figure 2-3: EU agri-food imports, 2018 (percentage of total).



Source: Defra, (2019).

In 2018, food products of UK origin accounted for 53 per cent of total UK food consumption, followed by those of EU origin (28 per cent) (Defra, 2019). A breakdown of total UK food consumption by origin in 2018 is shown in Table 2.1 below. At commodity level, UK's degree of self-supply is high for milk & dairy, poultry, lamb and cereals, but not for fruit, vegetables and pig meat (Revell, 2017).

Table 2.1: Origins of Food Consumption in the UK, 2018.

Rank	Region of Origin	% total food consumption
1	United Kingdom	53%
2	European Union	28%
3	Africa	4%
4	North America	4%
5	South America	4%
6	Asia	4%
7	Rest of Europe	2%
8	Australasia	1%

Source: Defra, (2019).

2.3 The Common Agricultural Policy (CAP)

The Common Agricultural Policy (CAP) is the agricultural policy of the EU launched in 1962. Since the UK joined the EU in 1973, it has implemented the CAP. The CAP was initially created to protect agriculture throughout the EU by influencing prices, output and farmers' incomes. Hence, the CAP is a system of subsidies and support programmes for agriculture operated by the EU (Saunders, 2008).

The CAP consists of two ‘pillars’: Pillar I includes direct payments and market measures to tackle specific market situations and to support trade promotion. Pillar II concerns rural development policy. Pillar II is aimed at achieving balanced territorial development and sustaining a farming sector that is environmentally sound, as well as promoting competitiveness and innovation (Cantore et al., 2011).

The European Community (EC) was founded by the Treaty of Rome in 1957, with Article 39 concerned with the development of a common market and policy for agriculture which was seen as essential for the formation of the EC. It is not surprising that this policy followed the model of continental Europe, restricting imports in order to raise domestic prices. Nonetheless it took another ten years for the policy to be developed and implemented.

Five specific objectives of the CAP were set out when the Treaty of Rome came into force in 1957 (EC, 2018a). These original five objectives were:

1. Increase agricultural productivity;
2. thus to ensure a fair standard of living for those engaged in agriculture;
3. stabilise markets;
4. availability of supplies;
5. to ensure that supplies reach consumers at reasonable prices.

When launched in 1962, the basic system of support in the CAP was, and to some extent still is, based upon the fixing of institutional prices. These institutional prices were, in the case of most commodities, set well above world market prices. This led to increases in production in the EU, aided by increases in productivity through technological change.

The CAP led to a number of well documented problems, with the predominant ones being the rising cost of the policy, the deterioration of international relations, and environmental degradation; hence pressures for reform increased (Saunders, 2008).

Since its launch, the CAP has been reformed considerably, aiming to reduce its cost (from 71 per cent of the EU budget in 1984 to 39 per cent in 2013) and a greater consideration of the environment and rural development. Reforms began in the 1980s with price reductions and the introduction of supply management measures in order to reduce the grain mountains and wine and milk lakes that occurred with increased internal production. Milk quotas were introduced in 1984, which was important for NZ as it reduced the amount of subsidised dairy exports into the world market. Next, the 1992 MacSharry reforms reduced the level of market price support and introduced direct payments (the Single Farm Payment) paid per hectare of crops and per head of livestock to compensate farmers. This was partly due to pressures under the WTO (Allen et al., 2014).

The next sets of reforms were Agenda 2000. The Agenda 2000 reform built on the McSharry reforms, with further cuts in price and increases in direct payments. This was radical in that it not only dealt with price cuts and detailed CAP policy but also the future financing of the CAP, the funds structure, EU enlargement; and most importantly it replaced the original objectives of the CAP with a set of objectives for rural policy. It also included the introduction of a ‘national envelope’ under which member states can pay producers additional subsidies so long as these did not encourage production. Member states were also allowed to

modulate direct payments to farms that did not meet environmental and/or social criteria. (Saunders, 2003).

As mentioned above, the most radical change in Agenda 2000 reforms was the removal of the objectives of agricultural policy established in the Treaty of Rome and their replacement with objectives for a rural policy. These new policy objectives not only integrate and simplify existing policies but opened up the agricultural budget to being diverted into support for rural areas. One of the historical problems with the reform of the CAP had been the size of the agricultural bureaucracy (Director General VI (DG Agriculture)), as the relative size of the agricultural support budget in the EU has shown. This can inhibit reform, as bureaucracies are reluctant to cede power. Thus allowing DGVI to develop and fund rural policy opened up possibilities of a future policy based not on agricultural production but on rural development (Saunders, 2003).

The objectives for rural policy under Agenda 2000 are as follows:

- to improve agricultural holdings,
- to guarantee the safety and quality of foodstuffs,
- to ensure fair and stable incomes for farmers,
- to ensure that environmental issues are taken into account,
- to develop complementary and alternative activities that generate employment, with a view to slowing the depopulation of the countryside and strengthening the economic and social fabric of rural areas,
- to improve living and working conditions and promote equal opportunities.

These differ from the original objectives of agricultural policy, outlined earlier in the report, and show the change in emphasis within the EU. The change in emphasis in these objectives is radically different as is the very existence of a rural policy (Saunders, 2003).

With the 2008 CAP Health Check reform the extent to which subsidies could continue to be coupled to production was reduced and the transfer of resources from Pillar 1 to Pillar 2 of the CAP (modulation) was increased. However, the fundamental features of the policy as agreed to in the Agenda 2000 and the decoupled Single Farm Payment remained (Allen et al., 2014).

In 2013, a new agreement on CAP reform (2014 – 2020) was achieved. The EU Commission explained that new policy has moved from product to producer support and now to a more land-based approach. New features of the CAP include (EC, 2013).

- a new policy instrument in Pillar 1 (greening) directed to the provision of environmental public goods.
- the CAP design is more efficient, targeted and coherent based on a more holistic approach to policy support through the maintenance of the existing two pillar structure;
- new flexibility for member states in the budgeting and implementation of Pillar 1 instruments, acknowledging the wide diversity of agriculture, agronomic production potential and climatic, environmental as well as socio-economic conditions and needs across the EU.

In the event of Brexit, the UK will withdraw from the EU and the CAP. This means that it is no longer entitled to the subsidies under the CAP and also faces restrictions on entering the EU for exports. The UK Government White Paper mentioned: “The Government will prioritise securing the freest and most frictionless trade possible in goods and services between the UK and the EU. We will not be seeking membership of the Single Market, but will pursue instead a new strategic partnership with the EU, including an ambitious and comprehensive Free Trade Agreement and a new customs agreement” (HM Government, 2017).

The current CAP agreement and funding runs until 2020. The UK allocation over the 2014- 2020 period of the CAP is €3.174 billion p.a. in direct payments (Pillar I) and €760 million p.a. in rural development funds for rural development and the environment (Pillar II). This makes the UK the fifth largest recipient of direct payments among the EU28 countries (EC, 2017a).

The UK Government has guaranteed to maintain the same allocation policy as currently for CAP until the end of the current Parliament, under the expectation that this will be 2022. The scale and nature of the immediate impact of Brexit on UK agriculture will largely depend on:

- Future levels of income support for farmers and rural development funding beyond the CAP and the approach to a common framework;
- The nature of any trade deal with the EU and how agriculture fares in trade-offs with other sectoral interests;
- How far access to migrant and seasonal labour is maintained;
- The degree of future divergence from the EU in terms of animal welfare standards, pesticide regulation, plant and animal health regulation, and food labelling requirements and protections.

Withdrawing from the CAP and the EU will have fundamental implications for the agricultural sector in the UK. The UK would need to design its own agricultural policy to replace the CAP and a fundamental part of any new UK agriculture policy would be to determine how farmers are supported. Also, the UKs environmental policy sector has been profoundly affected by EU membership, with many policies inheriting agri-environmental regulations such as the CAP which is used to protect the rural environment, i.e. farmers get more if they sign up to agro-environment commitments such as using fewer chemicals; leaving boundaries uncultivated; maintaining ponds, trees and hedges; protecting wildlife. Hence, depending on the exit option that is agreed on, the UK has to set out its own agri-environmental policy.

Van Berkum et al. (2016) pointed out that the UK government has always been a strong critic of the CAP, in particular with regards to its costs and its environmental impact. Van Berkum et al. (2016) assumed in case of Brexit the UK government would probably be more likely to reduce rather than increase the direct payments (as shown by the white paper) that are now made to farmers under the CAP Pillar I. With respect to Pillar 2 of the CAP (the Rural Development Policy), the UK has a well-developed policy, which addresses the provision of rural public goods and socio-economic growth priorities. Van Berkum et al. (2016) concludes that this links to societal concerns as well as to market failure, hence this policy might largely stay in place in case of Brexit.

With regards to trade, leaving the EU would mean that the UK would be able to set its own tariffs. The UK government has indicated that it wants, as far as possible, to keep the same set of tariffs as are applied by the EU, at least in the short term. A decision would be needed on whether to cut these tariffs which

would reduce prices for consumers but would increase competition between farmers in the longer term (Potton & Webb, 2017).

As mentioned above, the EU currently has 87 separate TRQs. In withdrawing from the EU, the UK and the EU would need to make a decision on splitting the current TRQs between the UK and the EU. The House of Lords EU Committee noted that coming to an agreement on the division of the EU's TRQs could be "challenging" because the reallocation would be open to negotiation by WTO members. It is recommended that the Government analyses current patterns of trade under the existing TRQs and the effects of a proposed split on agriculture and food manufacturing sectors.

The main challenge will be where EU TRQs have been obtained through bilateral negotiations with a third country; for example, NZ currently has country-specific TRQs for its high-quality beef, sheep, cheese and butter exports to the EU market. Changing this would require the consent of the importing country which makes negotiation processes more complicated (Saunders et al., 2016).

Further, as mentioned above, the EU has a range of free trade agreements with third countries (i.e. South Africa, Mexico, Chile and Korea). The UK would no longer benefit from these after Brexit and would need to renegotiate the free trade agreements that the EU has with third countries (Potton & Webb, 2017).

After Brexit, the UK might also pursue free trade agreement negotiations with countries that do not have a FTA with the EU. This might include some important points relating to agriculture. For example, the US, NZ and Australia may well seek improved access to the UK market (Potton & Webb, 2017).

2.4 Agricultural policy in the UK after Brexit

In September 2018 a new policy framework for agriculture post Brexit - *the Agriculture Bill* - was introduced to the UK Parliament. The framework emphasises the support for public goods and the delivery of outcomes that protect and enhance the environment. It also includes a plan to eliminate the direct payments that are currently implemented through the EU's Common Agricultural Policy over a gradual transition period between 2021 and 2027. Table 2.2 shows the timeline for this transition period. Farmers who currently receive the highest payments are to see the biggest reductions in the initial years. Percentage reductions will be increased over the transition until the final payments are made in 2027. To support new farmers entering the sector, direct payments during the agricultural transition period will be "delinked" from the requirement to farm the land up until 2027 (Defra, 2018).

The existing direct payment scheme will be replaced by a new Environmental Land Management (ELM) system which will officially start in 2020. Under the new system, farmers will receive payments to deliver 'public goods' such as improved soil health, better air and water quality, higher animal welfare standards and measures to reduce flooding, among other things (Defra, 2018).

Table 2.2: Timeline for gradual transition from direct payments to Environmental Land Management (ELM).

Year	CAP and CAP legacy	Future arrangements	Transitional Support
------	--------------------	---------------------	----------------------

2019	Direct Payments continue on the same basis as now with minor simplifications	Tests and trials for Environmental Land Management (ELM)	
	Countryside Stewardship (CS) agreements continue to be signed and Higher Level Stewardship (HLS) agreements extended as required		
2020	Direct Payments continue with further simplifications, where possible	Tests and trials for ELM	
	CS agreements continue to be signed and HLS agreements extended as required	Higher animal welfare standard defined, industry leadership role for animal health and welfare agreed	
2021	First year of progressive reductions to Direct Payments	First pilots and ongoing tests and trials for ELM	Transitional support schemes to build farm capability to manage risk, improve productivity and deliver public goods will be offered.
2022	CS agreements continue to be signed but number becomes dependent on ELM. HLS agreements extended as required	UK Shared Prosperity Fund starts	Supporting new entrants to get into farming
	End of current parliament and government commitment to maintain the same cash total funding for the sector		
2022-	Progressive reductions to Direct Payments continue	ELM pilots, tests and trials.	Initiatives to support new relationship between government and land managers
2024	Final CS agreements start (number dependent on ELM) and HLS agreements extended as required	Welfare pilots continue and animal health interventions on offer	
2025		ELM fully up and running	



2026		Measures to promote animal health and welfare fully up and running	
2027	End of 7 year transition period (last year Direct Payments)	Targeted investment in R&D and innovation (up to 2029)	
2028	No Direct Payments		

Source: Defra, (2018).

Chapter 3

An Overview of Access Options to the EU Single Market

This chapter presents the literature that examined the economic impacts of a withdrawal of the United Kingdom (UK) from the European Union (EU). These studies and reports have attempted to quantify the economic impact of a Brexit on the UK using different scenarios and assumptions.

Three possible alternatives to EU membership after Brexit are widely cited (Busch & Mattes, 2016). These are:

1. the **Norwegian Option**, i.e. admission to the European Economic Area (EEA);
2. the **Swiss Option**, i.e. bilateral agreements with the EU;
3. the **WTO/ No Deal Option** where the UK's trade relations with the EU would be organised according to the Most-Favoured-Nation (MFN) principle, which applies for all third countries where the EU does not have a preferential trade agreement.

Generally, the WTO Option is considered as the 'pessimistic/hard' scenario for UK-EU post-Brexit relations, while the other two options are considered 'optimistic/soft' scenarios.

This section starts with the Norwegian and Swiss options that would give some degree of economic integration between the UK and the EU in terms of Brexit, then followed by the WTO/ No deal option that has no integration. However, whilst the Norwegian and Swiss scenarios are considered soft scenarios, this may not be the case for agriculture.

3.1 Norwegian Option/ European Economic Area (EEA) membership

Norway is part of the European Economic Area (EEA) but not a member state of the EU. The EEA consists of 31 countries: the 28 EU member states, plus Norway, Iceland and Liechtenstein. The latter three countries are Member States of European Free Trade Association (EFTA). The three EFTA States and the EU Member States are united by the EEA Agreement¹ (Dhingra & Sampson, 2016).

The EEA Agreement entered into force in 1994, which guarantees Norway, Iceland and Liechtenstein the free movement of persons, goods, services and capitals within the EU's Single Market², as well as non-discrimination and equal rules of competition throughout the EEA. This means that Norway participates in the EU Single Market, and it must comply with EU rules regarding to the Single Market. However, Norway does not have a vote in deciding the rules of the Single Market (Dhingra & Sampson, 2016).

The EEA Agreement does not cover the common agriculture and fisheries policies, however it contains provisions on trade in agricultural and fish products. Other EU policies not included are the common trade

¹ Switzerland is also an EFTA state, however, it is not covered by the EEA Agreement. Switzerland has a separate bilateral free trade agreement with the EU, which is discussed in Section 3.3 Swiss Option.

² The Single Market refers to the EU as one territory without any internal borders or other regulatory obstacles to the four free movements (EC, 2017b).

policy; common foreign and security policy; justice and home affairs (the EEA/ EFTA States are however part of the Schengen area); direct and indirect taxation; or economic and monetary union (EFTA, 2019).

In addition, the EEA Agreement does not cover the EU Customs Union³. This means that Norway can set its own external tariff and negotiate its own trade deals with countries outside the EU (Dhingra & Sampson, 2016).

The EEA members effectively contribute to the EU budget to be part of the Single Market. Norway make its financial contribution to the EU budget through the EEA and Norway Grant scheme. From the period 2014 to 2020, Norway's average annual commitment to the EU was 447 million Euro (Dhingra & Sampson, 2016) which is 83 per cent of the UK's payment to the EU on a per capita basis (House of Commons, 2013). The UK's population is approximately twelve times larger than that of Norway. Thus, the UK could expect to continue contributing substantially to the EU's budget after Brexit under the Norwegian Option (Dhingra & Sampson, 2016).

If the UK choses the Norwegian Option, the EEA Agreement would give the UK the most access to the EU's Single Market (see Table 3.1). The UK would maintain the Single Market regulations as well as social and employment regulations of the EU. However, the UK would be a rule-taker, which means that it would have less say in shaping its rules than it does now as an EU member (Dhingra & Sampson, 2016).

Other downsides to joining the EEA might be that UK exporters' trade costs would increase due to the UK leaving the EU Customs Union. The UK has to comply with customs and rules of origins. Exports from Norway to the EU do not need regulatory checks; however, Norwegian exporters need to meet "rules of origin" requirements to benefit from preferential treatments. Under the Norwegian Option, UK exporters would face increased trade transaction costs due to customs checks (Dhingra & Sampson, 2016).

³ A Customs Union is a form of trade agreement. In a Customs Union, tariffs are eliminated between the states that form the Customs Union. Moreover, the participating states agree to apply a common external tariff to the goods imported into the Union from non-participating states. The EU is a Free Trade Area, as well a Customs Union.

Table 3.1: The relationship between Norway and the EU especially under the EEA.

Included under EEA agreement	Not included in EEA
Goods: Some agricultural and fisheries products; Energy; Competition and state aid; Trade facilitation and technical cooperation.	- Common Agricultural Policy (CAP) - Fisheries policy - Regional policy - External trade policy - Foreign policy
Services: Financial services; Transport Postal services; Electronic communication, audio-visual services and information society	
Capital Persons: Free movement of persons; Social security; Recognition of professional qualifications.	
Flanking and horizontal policies: Consumer protection; Cultural Affairs; Education, training and youth; Research and innovation; Public health; Enterprise policy; Civil protection; Health and safety at work and labour law; Environment; Employment and social policy; Company law; Budgetary matters; Gender equality, antidiscrimination and family policy	

Source: Adapted from EFTA⁴ and Booth et al. (2015).

Norway has a heavily protected agricultural sector and has limited access to the EU's agricultural sector. However, the EEA incorporates an agreement of trade in processed agricultural products (Protocol 3) and trade of basic agricultural products (Article 19). Protocol 3 regulates trade in processed agricultural products such as pizza and yogurt. Products included are subject to the general provisions of the EEA Agreement on the free movement of goods. In addition, Article 19 of the EEA entered into force between the EU and Norway on the 1st January 2012. Article 19 specifies that Norway and the EU should be committed to gradually liberalise trade in agricultural products. For Norway, Article 19 means an increase in the tariff-free export of cheese to the EU, as well as tariff-free quotas for a number of agricultural products, including berries, various snacks, dog and cat food, cod liver oil and Christmas trees. In particular, since 2016, Norway has had an agreement with the EU for a tariff free quota of 4,500 tonnes of cheese. For the EU, Article 19 increases the tariff-free import quota for cheese and various meat products, as well as certain inputs for the food preservation and feed industries. Norway does not always fill the available export quotas, whereas the EU generally does (Ministry of Foreign Affairs, 2015).

Under the Norwegian Option, the UK would reintroduce tariffs for its agricultural imports from the EU. The WTO tariffs would apply to third country imports. However, the UK could negotiate a trade agreement with the EU relating to agricultural products, as well as negotiate trade agreements with third countries.

3.2 Swiss Option

Switzerland is neither an EU member nor part of the EEA Agreement, but it has a number of sectoral bilateral agreements with the EU. Switzerland and the EU signed Bilateral Agreement I in 1999; this

⁴ EFTA, "European Economic Area: policy areas", accessed August 2018; <http://www.efta.int/EEA/Policy-Areas-2422>

includes free movement of persons, some agricultural trade, technical barriers to trade, government procurement, land transport, air transport and research. Bilateral I entered into force in 2002, and gradually removed tariffs on trade in primary agricultural products. Bilateral Agreement II between Switzerland and the EU was signed in 2004, which covers the Schengen⁵/Dublin⁶ agreements, processed agricultural products, interest and taxation, antifraud, the environment, statistics, film promotion and pensions. Bilateral Agreements I and II allow Switzerland to access part of the EU's Single Market. Switzerland has achieved a similar level of goods market integration with the EU as EEA countries through its EFTA membership and the bilateral agreements (Dhingra & Sampson, 2017).

Switzerland has a highly protected agricultural sector. With regards to agricultural trade, the EU and Switzerland have two sectoral trade agreements regulating trade in agri-food products. The EU-Switzerland Agricultural Agreement (also named Agreement between the European Community and the Swiss Confederation on trade in agricultural products), is one of the seven sectoral agreements under Bilateral I covering primary agricultural products since 2002. Under this agreement, tariffs are reduced on fruits and vegetables, horticulture, meat and wine. In particular, trade in cheese between Switzerland and the EU has been completely liberalised since 2007. The agreement also reduces or eliminates non-tariff barriers (NTBs) arising due to regulatory differences. For example, regulations in the areas of plant health, animal feed, seeds, organic farming, wine, fruit and vegetable have been mutually recognised as being equivalent between the EU and Switzerland (Schweizerische Eidgenossenschaft, 2016; Copenhagen Economics, 2016).

The Agreement on Processed Agricultural Products under Bilateral II liberalises a large amount of trade in processed agri-food products between the EU and Switzerland since 2005. The EU has no customs duties on a range of agri-food products imported from Switzerland such as chocolate and biscuits. In return, Switzerland reduces customs duties on some imports from the EU (Schweizerische Eidgenossenschaft, 2016).

Switzerland has limited market access in the Single Market with regard to the free movement of services (see Table 3.2). The EU and Switzerland have not reached a comprehensive trade agreement covering services. If post-Brexit the UK adopted the Swiss Option, the UK would need to negotiate a broader service agreement with the EU focusing on financial and business services.

Similar to Norway, Switzerland accepts most EU economic regulations and has very limited influence over the planning or shaping of the EU rules which it complies with. Like the EEA countries, Switzerland makes payment to the EU budget to cover the programmes it participates in.

If the UK adopted the Swiss Option, there would be less economic integration between the UK and the EU than with the EEA membership and the UK would have to follow EU rules to participate in the Single Market (Dhingra & Sampson, 2016).

⁵ The Schengen Association Agreement facilitates both travel between Switzerland and the EU, by lifting checks on people at the internal borders, and improves international justice and policy cooperation in the fight against crime (European Commission, 2018).

⁶ The Dublin Association Agreement ensures that an asylum application is only examined by one state within the Dublin Area. The Dublin Area includes all EU Member States. The Dublin criteria establish which state is responsible for dealing with an application. They prevent asylum seekers from being sent from one country to another and, when their first application for asylum has been denied, from submitting a new one in another country of the Dublin area (Schweizerische Eidgenossenschaft, 2018).

Another disadvantage of the Swiss Option would be that the UK would leave the Customs Union, as a consequence UK exporters would face increased trade transaction costs due to customs checks. In addition, the UK would have to comply with customs and rules of origins when trading with the EU (Dhingra & Sampson, 2016).

Busch & Matthes (2016) noted that the Swiss Option is unpopular in the EU, as the Bilateral Agreements between the EU and Switzerland were initially negotiated as an interim solution before EU-accession of Switzerland. Thus, it would be a question that whether the EU is willing to accept a similar relationship with the UK.

Table 3.2: The relationship between Switzerland and the EU.

Included in Swiss FTA and bilateral/Swiss access to EU markets	Not included
Goods: No import, export duties or quotas for industrial products; Some agricultural products (processed food); Trade facilitation and technical cooperation.	<ul style="list-style-type: none"> - Cross-border financial services - Energy and climate policy - Social and employment policy - Consumer rights - CAP - Fisheries policy - Regional policy - External trade policy - Foreign policy
Services: Limited cross-border provision of services for a maximum of 90 days per year under the terms of the free movement of persons agreement (excluding employment agencies and financial services)	
Capital: Non-life insurers have the freedom to establish operations in one another's territory	
Persons: Free movement of persons: Social security; Recognition of professional qualifications	
Other areas: Public procurement; Research; Overland transport; Air transport; Member of Schengen border-free area; Participants in 'Dublin system' for asylum claims; Taxation of savings; Fight against fraud; MEDIA programme.	
"Cooperation agreements": Membership of European Environment agency and EUROSTAT; education, vocational training and youth; Cooperation with Eurojust and Europol; Cooperation between competition authorities; European Asylum Support Office	

Source: Adapted from Schweizerische Eidgenossenschaft (2016) and Booth et al. (2015).

3.3 World Trade Organisation (WTO) Option/ Most Favoured Nation Principle

The WTO Option is also often called the No-Deal Option. It refers to the case if the UK does not reach a trade agreement with the EU by 31st October 2019, then by default, the UK will have to comply with the WTO rules of trade with the EU and third countries, including countries that currently have trade deals with the EU.

Since 2016 the WTO has 164 members comprising all major and most minor economies. The WTO rules require each member must grant the same “most-favoured-nation” (MFN)⁷ market access, which means charging the same tariffs, to all other WTO members (except countries that chose to enter into free trade agreements, such as the EU, EEA or EFTA, and they can give preferential market access to developing countries (see Table 3.3) (WTO, 2018).

Under the WTO option UK would lose its tariff-free market access to the EU Single Market and default to the WTO tariffs for all imports. Clearly, the imposition of tariffs on EU-UK trade would increase trade costs for both importers and exporters (Dhingra et al. 2017). These increases can be divided into three parts: (1) higher tariffs on imports; (2) higher non-tariff barriers (NTBs) to trade (arising from different regulations, border controls, etc.); and (3) the UK will not participate in future steps that the EU takes towards deeper integration and further reduction of non-tariff barriers within the EU (Dhingra et al., 2016).

The UK’s trade in services would also have to comply with the WTO rules, including the General Agreement on Trade in Services (GATS), and the Trade in Services Agreement (TISA). Booth et al. (2015) noted that the EU’s Single Market for trade in services is more liberalised than the WTO. This implies that the WTO membership would reduce access to EU markets for UK service producers. One of the advantages of WTO Option might be that the UK would stop making financial contribution to the EU budget.

With regards to agricultural trade policy, under the WTO Option, the UK would no longer be subject to the EU CAP. This would remove the current level of subsidies and the support that the agricultural sector receives under the CAP. These would be replaced by UK agricultural policy. UK-EU agricultural trade would be subject to tariffs for agricultural products under the WTO Agreement on Agriculture. Also, the UK’s approach to agricultural subsidies would come under WTO scrutiny (Swinbank, 2017).

As mentioned above, under the WTO Option, import tariffs and various controls would be imposed on trade between the UK and the EU, with impacts concentrated on agriculture and other industries that depend on products that repeatedly cross between the UK and the rest of the EU. The average import duty for agricultural goods that the EU (and, for now, the UK) charges is 8.7 per cent, however duties exceed 25 per cent for more than one in ten agricultural products. The highest tariff rates are in fact way above 25 per cent — the equivalent of 189 per cent for some dairy products and 116 per cent for some animal products. For processed food, the tariff rates are very complex, for example they could already change by reducing the sugar content in a product. Those rates do not apply to imports under free trade agreements or preferences for developing countries (the Generalised Scheme of Preferences (GSP)), but under the ‘no deal scenario’ they would have to apply to trade between the UK and the EU. Hence, under the WTO Option the impact on agri-food trade would likely be significant (Ungphakorn, 2017).

In addition, the EU and the UK would have to determine their respective shares of the EU’s tariff rate quotas (TRQs). TRQs are important in respect to the agricultural sector, as it is where each WTO member’s TRQs allow certain quantities of agricultural products to enter the market duty-free or at a rate below the bound rate. Downes (2017) has emphasised that “splitting” TRQs between the EU and the remaining EU27

⁷ MFN treatment requires the WTO members to accord the most favourable tariff and regulatory treatment given to the product of any one Member at the time of import or export of similar products to all other Members.

is challenging. This is because the EU's reallocation of the TRQs would be open to negotiation by the WTO members.

A particular example is the country specific quota for NZ lamb imports into the EU which is currently set at 230,000 tonnes. Inside this quota imports are duty free. However, outside this quota, a mixed tariff is charged which is up to 12.8 per cent of the price, plus up to €902 - €3,118 per tonne. The UK and the EU have jointly proposed to the WTO that their quotas should be split in a way that keeps the same total. The UK and EU requested that the share each country gets should be in proportion to the percentages of averages of 2013-15 EU trade data. For NZ lamb, this resulted in a 50:50 split - about 115,000 tonnes in each quota. However, NZ and a number of other countries have complained about this method as it weakens the trading rights they negotiated in the WTO because it reduces the commercial value of the quota. Also, partitioning the quotas in the proposed way would limit the flexibility of exporting countries to choose between exporting to the UK or another EU country where it might be more profitable. While the UK is a member of the EU, NZ can choose to export to any EU country where the prices are more profitable (Ungphakorn, 2017).

Table 3.3: A Summary of the WTO Option.

Included/Access to EU markets	Not included
Goods: MFN treatment	<ul style="list-style-type: none"> • Free movement of people • Cross-border financial services • Social and employment policy • Energy and climate policy • Consumer rights • Agricultural policy • Fisheries policy • Regional policy • External trade policy • Foreign policy
Services: Under the GATS, UK companies selling services through subsidiaries should not be discriminated against.	
Capital: The TRIMs (Trade Related Investment Measures) is designed to avoid trade distorting effects of investments in the goods trade. The OECD's "Code of liberalisation of Capital Movements" includes legally binding rule on non-discrimination on capital flows.	
People: The Uruguay trade round added liberalising measures on intra-company transferees regarded as "essential personnel" and business visitors.	
Other: Agreement on Government Procurement - a plurilateral deal on opening up of government procurement market	

Source: Booth et al., (2015).

A summary of the three alternatives for the UK after leaving the EU and their potential consequences are presented in Table 3.4. Overall, the Norway and Swiss Options would give the UK certain level of preferential market access to the EU Single Market. However, the UK would face a greater level of EU regulations under the Norway and Swiss Options. Under the WTO Option, the UK would regain full regulatory sovereignty while it would trade with the EU under the WTO rules. However, the table below excluded the impact on agriculture so whilst the Norwegian and Swiss options allow more access to the EU this is not necessarily the case for agriculture.

Table 3.4: Possible alternatives to EU membership and their consequences for the UK.

		Norway/EEA	Switzerland	WTO
Decision-making rights and representation in the EU		No	No	No
Customs Union		No	No	No
Tariffs on the UK exports to the EU		No	No	Yes
Single Market	Free movement of goods	Yes	Partial	No
	Free movement of persons	Yes	No	No
	Free movement of capital	Yes	No	No
	Free movement of services	Yes	Partial	No, GATS Rules
Renegotiation of FTAs		Yes	Yes	Yes
Increased trade costs due to RoO		Yes	Yes	Yes
Cost of customs clearance		Yes	Yes	No
Regulatory autonomy		Limited	Limited	Yes
Influence on EU Regulation		Very limited	No	No
Financial Contributions		Yes, partial	Yes, partial	No

Source: Busch & Matthes, (2016).

In the following two sections studies and reports are presented that analyse the impact of different exit scenarios and assumptions on the UK's economy and trade (Section 3.4) and especially on the agricultural sector (Section 3.5).

3.4 Effects of Brexit on the UK's economy and trade

This chapter presents the literature that examined the economic impacts of a withdrawal of the United Kingdom (UK) from the European Union (EU). These studies and reports have attempted to quantify the economic impact of a Brexit on the UK using different scenarios and assumptions.

Various studies have been conducted to estimate the economic impact of the UK leaving the EU on the UK's economy with the majority of them projecting a significant impact on the UK's economy from Brexit. HM Treasury (2016) estimated the long-term economic impact of Brexit on the UK's economic growth by 2030 using a gravity modelling approach. Three different scenarios were modelled: (1) the EEA membership (Norway Option); (2) a negotiated bilateral agreement (FTA/Swiss Option); and (3) WTO membership (WTO Option). Results showed that leaving the EU under all three options would have different degrees of negative impact on the UK's economy by 2030 (see Table 3.5). Among the three options, the WTO membership would be the alternative with the most long-term negative impact on the UK's economy. The findings showed that relying on WTO rules would result in a significant reduction in the UK's GDP by 2030 (decrease between 5.4 per cent and 9.5 per cent). This is equivalent to a loss of £5,200 per annum per UK household over the long-term. In comparison, under the EEA membership Option, the total loss was estimated between 3.4 per cent and 4.3 per cent of GDP by 2030. This loss of GDP is equivalent to £1,100 less per year for each household. HM Treasury (2016) noted that leaving the

EU to join the EEA would maintain substantial access to the EU Single Market. However, the introduction of customs borders with the EU would increase trade transaction costs.

Under the FTA Option (Swiss Option), HM Treasury (2016) predicted that the UK's GDP would fall between 4.6 per cent and 7.8 per cent by 2030. This is equivalent to a loss of £1,100 per year for each household. HM Treasury (2016) suggested that the FTA Option provides less access to the Single Market when compared to the EEA membership Option.

Table 3.5: Annual impact of Brexit on the UK in 2030.

	EEA Scenario	FTA Scenario	WTO Scenario
GDP level (%) - central	-3.8	-6.2	-7.5
GDP level (%)	-3.4 to -4.3	-4.6 to -7.8	-5.4 to -9.5
GDP per capita - central	-£1,100	-£1,800	-£2,100
GDP per capita	-£1,000 to -£1,200	-£1,300 to -£2,200	-£1,500 to -£2,700
GDP per household - central	-£2,600	-£4,300	-£5,200
GDP per household	-£2,400 to -£2,900	-£3,200 to -£5,400	-£3,700 to -£6,600
Net impact on receipts	-£20 billion	-£36 billion	-£45 billion

Source: HM Treasury, (2016).

Overall, HM Treasury (2016) concluded that their economic analysis showed that all options increased the economic costs for the UK. The UK would have to negotiate new trade agreements with the EU to have preferential access to the Single Market. The analysis further showed that in all options trade transaction costs were increased between the UK and the EU. Combined, the reduced access to the Single Market and increased trade transaction cost would potentially make the UK a less attractive destination for foreign investment. Lastly, with all options the UK would not be able to benefit from the EU's FTAs with third countries. Hence, the UK's access to global markets might be reduced as the UK would have to renegotiate FTAs with third countries (HM Treasury, 2016).

In their study, PwC (2016) applied a computable general equilibrium (CGE) model to analyse the potential economic impacts of leaving the EU on the UK in 2020, 2025 and 2030, respectively. Two scenarios were analysed; these were (1) FTA scenario, i.e. the UK exits and negotiates a free trade agreement with the EU, based on tariff-free trade in goods (but not services). The UK would have to implement EU standards on goods supplied to the EU, but otherwise would not be bound by the four freedoms of the Single Market; and (2) WTO scenario, where no agreement is made and the UK trades at WTO tariff levels. Results are shown in Table 3.6. It can be seen that by 2020, the UK GDP would drop by 0.3 per cent in the FTA scenario and by 5.5 per cent in the WTO scenario. In 2030, UK GDP would decrease by 1.2 per cent in the FTA scenario and by 3.5 per cent in the WTO scenario. With regards to trade impacts, the study showed that trade between the UK and the EU in 2020 would drop by 0.5 per cent and 1.7 per cent in the FTA and WTO scenarios, respectively, compared to the UK remaining a member of the EU. The UK's trade with the EU would decrease by 2.1 per cent in the WTO scenario in 2030.

Table 3.6: Results of the PwC study (percentage change).

	FTA scenario			WTO scenario		
	2020	2025	2030	2020	2025	2030
Trade	-0.5	-0.5	-0.5	-1.7	-1.9	-2.1
Total impact on GDP	-0.31	-1.1	-1.2	-5.5	-4.1	-3.5
Impact on GDP per Capita	-3	-0.9	-0.8	-5.4	-3.6	-2.7

Source: PwC, (2016).

In a similar study, Booth et al. (2015) assessed the economic impact of the UK leaving the EU on the UK's economy using a computable general equilibrium (CGE) model. The authors simulated four possible scenarios for the UK-EU relations after Brexit in 2030. These scenarios were (1) WTO scenario; (2) FTA 1: comprehensive FTA between EU and UK; (3) FTA 2: UK – EU FTA and unilateral free trade with the rest of the world. (4) UK - EU FTA no financial contribution to EU budget, deregulation of UK economy and opening up almost fully to trade with the rest of the world. Table 3.7 shows that in the WTO scenario in 2030 UK GDP would decrease by 2.2 per cent which equals to a welfare loss of £55.52 billion. In the FTA 1 scenario, UK GDP was estimated to drop by 0.8 per cent by 2030. In contrast, in the FTA 2 scenario UK GDP would increase 0.6 per cent by 2030 and even further by 1.6 per cent in the fourth scenario UK - EU FTA (4) (Booth et al., 2015).

Table 3.7: Impacts on UK of Brexit on Real GDP and Welfare.

	Worst case Brexit: WTO scenario		UK-EU FTA (1)		UK-EU FTA (2)		Brexit best case: UK-EU FTA	
	%GDP	£bn	%GDP	£bn	%GDP	£bn	%GDP	£bn
Total welfare gain/ loss	-2.23	-55.52	-0.81	-22.12	0.64	8.78	1.55	34.78

Source: Booth et al., (2015).

In their study, Dhingra et al. (2017) used a general equilibrium trade model to examine the economic costs and benefits of Brexit under two scenarios: (1) a 'soft Brexit' (the Norway Option) and (2) a 'hard Brexit' (the WTO Option). Results on welfare effects showed that leaving the EU would reduce the welfare of British citizens in both scenarios. As shown in Table 3.8 the total welfare change in the 'soft Brexit' scenario was estimated at -1.3 per cent, (which equals a loss of -£25.1 bn in GDP or -£893 income loss per household) and at -2.7 per cent (which equals -£49.8bn in GDP or -£1,773 income loss per household) in the 'hard Brexit' scenario.

Table 3.8: Impact of Brexit on living standards in different regions.

	Soft Brexit		Hard Brexit	
	Change in % welfare	Change in GDP (£bn)	Change in % welfare	Change in GDP (£bn)
UK	-1.34	-25.1	-2.66	-49.8
All EU countries except UK	-0.14	-12.3	-0.35	
Non-EU countries	0.01	3.7	0.02	7.4

Source: Dhingra et al., (2017).

Table 3.9: Change in UK trade flows after Brexit.

Scenario	Horizon	Total UK Exports (%)	Total UK Imports (%)	Exports to EU (%)	Imports from EU (%)
Soft Brexit scenario	Short run	-5	-6	-14	-13
	Long run	-9	-8	-25	-22
Hard Brexit scenario	Short run	-14	-14	-36	-34
	Long run	-16	-16	-43	-38

Source: Dhingra et al., (2017).

With regards to UK trade flows after Brexit (see Table 3.9), Dhingra et al. (2017) found that in the ‘soft Brexit’ scenario, total UK exports would decrease by 5 per cent in the short run (1 year after Brexit) and by 9 per cent in long run (10 years after Brexit). Moreover, UK exports to the EU would fall by 14 per cent in the short run, and by 25 per cent in the long run. In the ‘hard Brexit’ scenario, total UK exports were projected to fall 14 per cent and 16 per cent in the short run and long run, respectively. The UK’s exports to the EU would drop by 36 per cent in the short run, and 43 per cent in the long run, respectively.

Dhingra et al. (2017) concluded that the economic consequences of Brexit will depend on the future of UK-EU trade relations. However, the results of two alternatives showed that leaving the EU would lower UK – EU trade because of reduced integration with EU countries.

Finally, Table 3.8 shows also that countries outside the EU may gain from Brexit, although the numbers are very close to zero. This is because of trade diversion effects due to the fact that the UK partially switches from trading with the EU to trading with non-EU countries (which in turn benefit from more trade with the UK) (Dhingra et al., 2017).

In another study, Figus et al. (2018) used a computable general equilibrium (CGE) model to examine the long-term economic impact of Brexit on Scotland and the rest of UK (RUK). The authors considered the FTA and the WTO scenarios for the UK-EU interactions post-Brexit. Results showed a substantial reduction in trade between Scotland and the EU for goods and services under both FTA and WTO scenarios. In the WTO scenario total exports prices were projected to decrease by 0.6 per cent in the short run, 3.2 per cent after 5 years, 6.7 per cent after 10 years and 8.3 per cent in long run. Scottish export prices of goods to the EU were projected to fall 5.1 per cent in the short run, 25.7 per cent after 5 years, 50.5 per cent in 10 years and 51.8 per cent in the long run. Figus et al. (2018) pointed out the reduction in export prices is obviously due to the imposition of the tariff on Scottish goods exported to the EU.

In terms of the results under the FTA scenario, Figus et al. (2018) reported that the total export prices would drop by 0.2 per cent in short run and 6.1 per cent in long run. Scottish export prices of goods to the EU were projected to decrease by 4.1 per cent in short run, 39.3 per cent in long run. In addition, the import prices of goods from the EU were projected to drop by 5.2 per cent and 37.3 per cent in short run and long run.

In their study, Boulanger & Philippidis (2015) used a computable general equilibrium (CGE) model to model scenarios with the assumptions of nationalisation of the UK's payments to the EU, a free trade agreement with the EU and adoption of the existing EU external tariff on non-EU trade. Under the UK-EU FTA scenario, model projections indicated a small real income gain for the UK (i.e. 0.6 per cent of per capita GDP) which is generated by increases in (tariffed) imports of non-EU origin. However, this would turn into a loss of 0.7 per cent of UK per capita real income under conditions of higher assumed trade transaction costs arising from the loss of Single Market access.

In their study, Mion & Ponattu (2019) assessed the economic impact of Brexit on European countries and regions using a general equilibrium trade model. In two different scenarios – a soft and hard Brexit- Mion & Ponattu (2019) examined impacts on productivity, markups, product variety, welfare and the distribution of population across European countries and regions. Results showed that Brexit in general – hard or soft – was projected to have a significant, but regionally varying, impact on welfare. The UK was projected to experience the most significant impact from the UK leaving the EU. Aggregate welfare losses in the hard Brexit scenario were projected to amount to 57 billion Euros annually (-873 Euros per capita). In a soft Brexit scenario, the aggregate welfare loss was projected to amount to 32 billion Euros for the UK (-500 Euros per capita). With regards to the other countries, the welfare losses were stronger the closer a country is to the UK as shown in Table 3.10 (Mion & Ponattu, 2019).

Table 3.10: Welfare income loss in selected European countries.

Income Loss		<i>in billion Euros</i>	
		Soft Brexit	Hard Brexit
1	Great Britain	32.26	57.34
2	Germany	5.27	9.5
3	France	4.29	7.73
4	Italy	2.28	4.12
5	Ireland	1.87	3.41
6	Netherlands	1.75	3.16
7	Spain	1.73	3.12
8	Belgium	0.94	1.69
9	Sweden	0.79	1.43
10	Switzerland	0.74	1.34

Source: Mion & Ponattu, (2019).

To conclude, a large number of studies have been conducted to estimate the economic impact of the UK leaving the EU on the UK's economy. The majority of these projected a negative impact on the UK's economy from Brexit with a projected reduction of GDP and loss in household income with amounts varying between different scenarios. The exception being when it is assumed the UK can cease payments to the EU and yet continue tariff free access and current levels tariff with the rest of the world, a rather unrealistic scenario. The studies further showed that these welfare impacts vary regionally with welfare losses predicted to be stronger the closer a country is to the UK.

3.5 Impacts of Brexit on agriculture and trade in the UK and elsewhere

A few studies have assessed the potential effects of the UK exiting the EU on agriculture and trade using different scenarios and assumptions. In their study, Davis et al. (2017) analysed the impact of three different Brexit trade scenarios on seven UK agricultural commodities (beef, sheep, pigs, poultry, milk & dairy, wheat and barley) using a partial equilibrium modelling framework: the FAPRI-UK model⁸ in combination with the FAPRI-EU model (GOLD)⁹. The scenarios were (1) Bespoke Free Trade Agreement with the EU; (2) WTO Default; and (3) Unilateral Trade Liberalisation. Results from each scenario were compared to the baseline in 2025 that assumed that the UK remains in the EU. Table 3.11 outlines the three trade scenarios in more detail. In addition, the MFN tariffs applied in WTO default scenario are

⁸ This model was developed by Agri-Food and Biosciences Institute (AFBI-Economics).

⁹ This model is run by Food and Agricultural Policy Research Institute (FAPRI) at the University of Missouri.

presented in Table 1.1 of the Appendix. Further, the authors assumed that the UK inherits the EU's tariff structure to third countries in terms of exports from the UK to the rest of the world. In addition, TRQs applied by the UK from third countries are retained. TRQs for the UK are calculated based on the average level of imports from the rest of world in the last five years.

Table 3.11: Trade scenario definitions.

Bespoke Free Trade Agreement with the EU (Scenario 1)	WTO Default (Scenario 2)	Unilateral Trade Liberalisation (Scenario 3)
<ul style="list-style-type: none"> • UK retains tariff and quota free access to the EU and EU retains tariff and quota free access to the UK • UK maintains EU tariff structure to rest of the world • 5% trade facilitation costs on UK-EU27 trade 	<ul style="list-style-type: none"> • MFN tariffs applied to imports from the EU • TRQs from third countries retained • MFN tariffs applied to UK exports destined for the EU • No changes in tariff structure for exports to the rest of the world • 8% trade facilitation costs on UK-EU27 trade 	<ul style="list-style-type: none"> • Zero tariffs applied on imports to the UK from both the EU and the rest of the world • MFN tariffs applied to the UK exports destined for the EU • No change in tariff structure for exports to the rest of the world • 8% trade facilitation costs on UK-EU27 trade

Source: Davis et al., (2017).

Overall, the authors estimated that the changes to product prices, production and trade were relatively smaller in the FTA scenario, than in the WTO default scenario and in the Unilateral Trade Liberalisation scenario (see Table 1.2 to 1.4 in the Appendix). The imposition of MFN tariffs in the WTO default scenario would lead to significant adjustments in trade between the UK and the remaining EU countries. In turn, these changes in trade would have a significant impact on the domestic market, prices of all commodities were projected to decline in the unilateral trade liberalisation scenario. Davis et al. (2017) suggested that domestic productivity and competitiveness under the trade liberalisation scenario would have to be improved urgently, as producers would be much more exposed to direct competition with international suppliers.

In more detail, results showed that in the Bespoke FTA scenario commodity prices were projected to increase due to the higher trade transaction costs. As shown in Table 1.2 to 1.4 in the Appendix, UK prices were projected to grow for commodities in which the UK is a net importer, such as beef (+3 per cent) and cheese (+1 per cent). In contrast, UK prices were projected to drop for commodities in which the UK is a net exporter, such as barley (-1 per cent) and sheepmeat (-1 per cent).

In the WTO default scenario, results showed that the impact of Brexit on the selected commodities varied by sector. In the UK beef sector, the implementation of high MFN tariffs on beef products had significant impact on beef trade flows between the UK and the remaining EU countries. As a result, the UK beef price was projected to increase by 17 per cent by 2025. Similarly, prices in the pigmeat and poultry sectors were projected to increase by 18 per cent and 15 per cent, respectively. Similarly, results for dairy commodities showed that UK cheese and butter prices were projected to increase by 29 per cent and 43 per cent,

respectively compared to the baseline in 2025. In contrast, sheepmeat prices were projected to decrease by 18 per cent by 2025 (Davis, et al, 2017).

With regards to trade, Davis et al. (2017) found that in the WTO scenario UK crop exports to the EU were projected to fall by 2025, with wheat exports projected to collapse entirely and barley exports falling by 80 per cent. Also, UK cheese imports from the EU were projected to fall significantly, while butter imports from the EU were projected to collapse completely.

Under the Unilateral Trade Liberalisation scenario, Davis et al. (2017) indicated that the elimination of tariff barriers would have an overall negative impact on UK prices across all commodities. Producer prices were projected to fall significantly in beef (-45 per cent) and sheep (-29 per cent), and more moderately in pigs (-12 per cent), milk & dairy (-10 per cent), poultry (-9 per cent), barley (-7 per cent) and wheat (-5 per cent).

Bellora et al. (2017) applied the MIRAGE model¹⁰ to estimate the impact of Brexit on the EU-UK agricultural trade. In their study, the impacts of three different WTO trade scenarios on 19 agri-food industries, 14 manufacturing sectors, 8 services sectors and 35 geographical areas were modelled. The scenarios were (1) the WTO scenario, which applies WTO rules for EU-UK trade, as well as trade between the UK and non-EU countries. In this scenario, Bellora et al. (2017) assumed that tariffs and non-tariff-measures (NTMs) would be imposed on bilateral agricultural trade between the UK and the EU, and between the UK and Turkey. (2) WTO (Tariff Only) scenario which uses bilateral tariffs up to MFN level between the UK and EU, no NTMs; (3) WTO (Ireland NTM) scenario which assumed that Ireland would face higher Ad Valorem Equivalent (AVE) for NTMs when trading with the EU after Brexit. Tariff and NTM shocks were introduced in 2021 and projected out to 2030.

Results showed that there was a large decrease in EU27-UK agri-good trade flows in the WTO scenario. In this scenario, European agri-food exports to the UK were projected to decrease by 62 per cent. Some agri-food exports from the EU to the UK, such as rice, white meat, sugar, dairy and red meat were projected to almost completely collapse, falling by over 90 per cent by 2030. In contrast, in the “WTO Tariff only” scenario, Bellora et al. (2017) found that the impacts of Brexit on the EU27-UK agri-food products were almost halved with the exception of red meat (and sugar and dairy products to a smaller extent). For those sectors, the WTO tariff only scenario was projected to have almost the same impact than the WTO scenario. The authors explained that for these sectors protection comes mainly from the MFN tariff, not from NTMs. Results further showed that direct impacts on European agri-food exports to UK were offset by increased exports to all other trading partners.

With regards to EU sub-regions, Bellora et al. (2017) identified that Ireland, the Netherlands and France were projected to lose the most in terms of trade by volume among the EU states. For example, results showed that Ireland’s exports to the UK were projected to decrease 70 per cent by volume. Exports from the Netherlands and France to the UK were projected to fall by 66 per cent and 51 per cent by volume, respectively. Bellora et al. (2017) pointed out that the significant decrease in these countries was due to these countries having large volumes of exports to the UK.

¹⁰ The MIRAGE model is a recursive-dynamic computable general equilibrium model designed for trade policy analysis (Bellora, et al. 2017). A detailed description of the model in <http://www.mirage-model.eu>.

The study concluded that for the majority of sectors, the impact of NTMs is nearly twice that of the tariffs and hence drives the impacts on trade, with the exception of red meat, sugar and dairy. Therefore, the implementation of MFN tariffs on trade between the UK and the EU27 would have a negative impact on bilateral trade between the two countries. In addition, the increase in both NTMs and tariffs would have stronger impacts on bilateral trade between the UK and the EU27 compared to only increasing tariffs (Bellora et al., 2017).

In their study, Jongeneel et al. (2016) used the partial equilibrium model - AGMEMOD model, to analyse the impact of Brexit on British agriculture and the food sector. Nine agricultural products were selected in their study: soft wheat, barley, oilseeds, sugar, beef, pork, poultry, sheep and raw milk. Jongeneel et al. (2016) combined three agricultural supports and three trade options into nine agricultural policy and trade scenarios. The options of agricultural support considered in their study included: firstly, retention of 100 per cent of the current level of direct payments to UK farmers; secondly, reduction of these payments from 100 per cent to 50 per cent; and thirdly, complete elimination of direct payments. The three trade scenarios in their study were (1) UK-EU FTA, (2) Default WTO, and (3) UK Trade Liberalisation. Table 3.12 summarises the combined agricultural policy and trade scenarios.

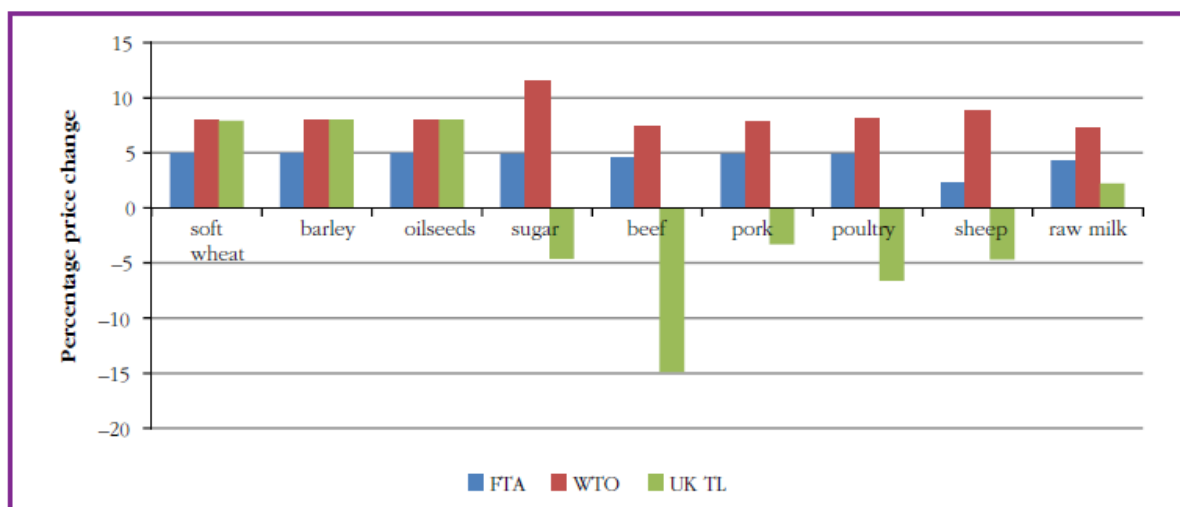
Table 3.12: Overview of trade scenarios.

Trade policy scenario	Agricultural policy scenario			
	FTA between EU and UK (FTA)	100% Direct Payment (DP); 5% trade facilitation costs (TFC)	50% DP; 5% TFC	No DP; 5% TFC
	Default WTO (WTO)	100% DP; 8% TFC	50% DP; 8% TFC	No DP; 8% TFC
	UK Trade Liberalisation (UK TL)	100% DP; 8% TFC	50% DP; 8% TFC	No DP; 8% TFC

Source: Jongeneel et al., (2016).

Under the FTA and Default WTO scenarios, results indicated that the average producer prices would increase 4.5 and 8.3 per cent, respectively (see Figure 3-1). Correspondingly, the UK's domestic production was projected to grow in the FTA and Default WTO scenarios. Due to the loss of the UK's access to EU preferential imports, producer prices for sheep meat, poultry meat, butter, cheese and sugar were projected to increase by 4.2, 0.3, 0.8, 0.3 and 3.8 per cent, respectively. Jongeneel et al. (2016) noted that the increased producer prices would be positive for the producers, however, in turn, this would have a negative impact on the UK's domestic consumers in the two scenarios.

Figure 3-1: The percentage price changes for selected crops and animal products.



Source: Jongeneel et al., (2016).

In addition, Jongeneel et al. (2016) showed that the UK Trade Liberalisation scenario was expected to have a significant negative impact on producer prices for all animal products (except for raw milk) and sugar. In particular, the beef price was projected to decline by 15 per cent. In contrast, producer prices were projected to increase for wheat, barley and oilseeds, as shown in Figure 3-1.

In a different study, Van Berkum et al. (2016) analysed the effects of Brexit on British agriculture at country/EU level and at farm-level using the AGMEMOD modelling approach. In their study, 12 commodities were selected and analysed; these were soft wheat, barley, rape-seed, sugar, beef, pork, poultry, sheepmeat, butter, cheese, skim milk powder and whole milk powder. The authors considered three trade policy scenarios in the event of a Brexit (see Table 3.13 for more detail): (1) UK-EU FTA scenario, (2) WTO-default scenario, and (3) UK trade liberalisation scenario.

Table 3.13: Overview of scenarios.

Name/label of scenarios	Agricultural policy assumptions		
	No changes in Rural Development	Policy plus ...	
	100% Direct payments (DP)	50% DP	No DP
Baseline	Benchmark (existing CAP applies)	Not considered	Not considered
FTA between UK and EU	FTA+100%DP	FTA+50%DP	FTA+0%DP
WTO default position	WTO+100%DP	WTO+50%DP	WTO+0%DP
UK Trade Liberalisation	UK TL+100% DP	UK TL+50%DP	UK TL+0%DP

Source: Van Berkum et al., (2016).

Results showed that in the FTA scenario, prices of for selected agricultural products were projected to increase. Growth ranged from 2.3 per cent to 5.5 per cent. Correspondingly, these higher prices were projected to increase production of these agricultural products as shown in Table 1.5 in the Appendix.

Similarly, in the WTO default scenario, prices for agricultural product were projected to increase (ranging from +7.2 to +11.5 per cent) (see Table 1.6 in the Appendix). Due to the price increases, production of most products was projected to grow, except for eggs and cheese production which were projected to decrease by 1.3 per cent and 0.2 per cent, respectively (Van Berkum et al., 2016).

In the UK Trade liberalisation scenario the impacts on prices differ over the commodities as shown in Table 1.7 in the Appendix. In general, the impact on crop prices (except for sugar) was small reflecting the fact that current EU prices are already similar to world prices. Sugar and animal products (meats and dairy products) still have a much higher degree of protection. Therefore, halving the import tariffs for these products would lead to significant price drops for these products, such as 18 and 19 per cent for beef and sheep meat, respectively.

In a follow-on study, Van Berkum et al. (2018) assessed the impacts of two Brexit scenarios on Dutch agricultural trade flows, using the AGMEMOD modelling approach. The scenarios were (1) EU – UK Free Trade Agreement, including 5 per cent trade transaction costs and (2) WTO default scenarios, the UK applies MFN tariffs, including 8 per cent trade transaction costs. Results from the EU – UK FTA scenario showed that Dutch exports to the UK and the rest of the world were projected to be affected only marginally. In contrast, the WTO scenario was projected to have a greater, but still relatively modest, impact on Dutch agricultural exports as a result of Dutch price competitiveness in the UK market. Results further showed that the value of agricultural production in the Netherlands was projected to decline by around 2 per cent due to prices dropping (as a result of price pressure in the EU market as a consequence of Brexit-related trade distortions). The authors pointed out that potential impacts of non-tariff measures on trade costs were not included in the analysis.

In their study, Hubbard et al (2018) used a Computable General Equilibrium Model, a Partial Equilibrium Model and Farm Level Models to analyse the impact of various trade and domestic policy scenarios after Brexit on the UK economy, and particularly on its agricultural sector. Three scenarios were developed, (1) UK–EU Free Trade Agreement (FTA); (2) Unilateral Trade Liberalisation (UTL); and (3) return to WTO tariffs (EU Tariffs Schedule - WTO).

Results showed that Brexit was projected to have an overall negative impact on the UK Gross Domestic Product (GDP), however impacts were relatively small, as shown in Table 3.14. The largest impact was projected in the WTO scenario. Under the MFN tariff schedules UK GDP was projected to fall by 0.4 per cent per annum on average, whereas in the UTL scenario UK GDP was projected to fall the least of 0.22 per cent per annum on average (Hubbard et al., 2018).

Table 3.14: CGE general effects on UK GDP, agri-food output and prices, percentage changes to baseline projections in 2026.

	Scenarios					
	FTA		UTL		WTO	
	+DP	-DP	+DP	-DP	+DP	-DP
UK GDP (%)	-0.34	-0.33	-0.22	-0.22	-0.42	-0.41
<i>UK Production (%)</i>						
Agriculture	0.4	-2.9	-0.9	-4.2	1.9	-1.1
Food	0.4	-0.6	2	0.9	0.8	0
-all meat (red and white)	2	-0.8	-11.8	-15	14.8	12.5
<i>UK Prices (%)</i>						
Agriculture (farm gate)	0.1	3.3	-0.5	2.6	2	5.5
-crops	0	2.6	0	2.3	1.2	4
-livestock	0.1	3.7	-0.8	2.8	2.5	6.4
Food retail prices	0.4	0.8	0	0.3	3.7	4.1
-all meat (red and white)	1.1	2	-4.3	-3.6	7.3	8.3

Note: DP= Direct Payment

Source: Hubbard et al., (2018).

In addition, in the WTO (+DP) scenario, UK farm gate prices for primary agriculture and retail prices for processed food were projected to increase. Compared to the baseline, prices in the meat sector and food processing were projected to increase by 7.3 per cent and 3.7 per cent, respectively. These price effects were consequences of the adjustment to WTO MFN tariffs on EU trade and the imposition of UK and EU trade transaction costs (4 per cent for crops and 8 per cent for livestock). The removal of direct payments (WTO (-DP)) was projected to increase the equivalent per unit cost of agricultural production, resulting in further price increases (Hubbard et al., 2018).

In the UK-EU FTA scenario projected impacts on the UK agricultural sector were relatively modest. In contrast, in the UTL scenario significant negative impacts on prices, production and incomes were projected. The adoption of the EU's WTO tariffs on imports favours net importers (e.g. dairy) and negatively affects net exporters (e.g. sheep).

Hubbard et al. (2018) explain that given the strong dependence of most UK farms on direct payments, their removal worsens negative impacts of new trade arrangements and offsets positive impacts. These impacts vary across different types and farm sizes, but also regionally. However, the period of adjustment to new trade and domestic policy conditions may be very challenging for many farm businesses (Hubbard et al., 2018).

In their study, Sik Choi et al. (2019) examined the impacts of three different Brexit scenarios on the UK's agri-food sector using the agricultural sector model CAPRI. The three scenarios include increasing barriers to trade (1) EEA+, all tariffs on agricultural commodities removed, (2) EU-UK FTA including trade transaction

costs, (3) WTO MFN tariff rates. Table 3.15 presents the three scenarios in more detail. Results were then compared to the baseline scenario in which the UK remains in the EU in 2030.

Table 3.15: Brexit Scenarios.

	Soft Brexit		Hard Brexit (No deal)
	EEA+	FTA	WTO
NTBs	5.0%	7.9-12.7%	12.6% (for primary products) 24.2% (for processed products)
Tariff (UK-EU27)	No tariffs	No tariffs	MFN tariffs
UK's EU budget (CAP) contribution	Yes	No tariffs	No
TRQs	historical level TRQs remain in the UK		
UK's trade with the ROW	UK retains EU's FTAs with third countries		

Note: NTB costs are shown in ad-valorem equivalent tariff rates.

Source: Sik Choi et al., (2019).

Overall, results showed that Brexit has a much larger impact on trade patterns in the UK compared to the EU27. Even in the EEA+ scenario, UK exports were projected to drop by between 10 -25 per cent for all commodities due to the additional 5 per cent trade transaction costs. In the WTO scenario, cereals, meat and dairy exports were projected to fall by more than 60 per cent. In addition, imports to the UK were projected to drop in all product categories except oilseeds (Sik Choi et al., 2019).

Results further showed that UK producer prices for the majority of commodities were projected to increase; this was due to a drop in imports to the UK. In the EEA+ and FTA scenarios, projections of producer price changes were rather small (less than 5 per cent) for all commodities. The highest impacts were projected in the WTO scenario, where producer prices of meat and dairy products were projected to rise by 12 per cent and 7.5 per cent, respectively (Sik Choi et al., 2019).

In terms of welfare impacts from the three scenarios, Sik Choi et al. (2019) showed that in all scenarios, UK consumers (-12 to -125 €/capita) and producers in EU27 (income losses, -0.2 to -2.5 per cent) were affected. However, the authors pointed out that if trade costs were kept low, the termination of the contribution to the EU CAP and the gains to producers from higher food prices could offset the losses to consumers. In the EU, falling food prices would benefit consumers but would reduce farmers' incomes (Sik Choi et al., 2019).

In a recent study conducted by The Andersons Centre (2019), the impacts of two different Brexit scenarios on British beef and sheepmeat trade and the supply-chain were examined. The scenarios were Brexit Deal (i.e. EU-UK FTA) and No Deal (WTO Default position). Results showed that under the Brexit Deal scenario the impact on trade was projected to be relatively small with slight decreases projected for beef and sheepmeat exports (1.1 per cent) from the UK to the EU27 due to non-tariff measures (see Appendix Table 1.8). In contrast, under the No Deal scenario projections indicated significant drops in beef and sheepmeat trade between the UK and the EU27 due to the imposition of tariffs, TRQs and a higher incidence of NTMs (see Appendix Table 1.9). Combined beef and sheepmeat exports to the EU were projected to fall by 92.5 per cent, with sheepmeat exports projected to be almost completely wiped out.

Results on the impact on prices to 2022 showed small decreases in the Brexit Deal scenario (-1 to -3 per cent, respectively) while in the No Deal scenario sheepmeat prices were projected to drop by 24 per cent and beef by 4 per cent. Combining the price and quantity effects, the overall impact on the value of domestically produced carcass meat output under a Brexit Deal was projected to fall by 1.7 per cent while under the No Deal scenario the decline would increase by nearly ten-fold (-11.7 per cent) with sheepmeat output almost 31 per cent lower. (The Andersons Centre, 2019).

In his study, Revell (2017) focussed on the issues surrounding EU28 Tariff Rate Quotas (TRQs) relating to the trade of livestock products between the UK and the EU post-Brexit. The author assumed that the EU and the UK would adopt their trade commitments through the WTO, which means the UK and the EU would have to set their own schedule of TRQs at the WTO. Hence, both the UK and EU would need to make a decision on splitting the current TRQs between them in case of Brexit. This would involve negotiating trade agreements not only between the remaining EU countries and the UK, but also with third country exporters regarding market access.

Revell (2017) emphasised that the TRQs play a key role for the management and control of external competition in the EU28's agri-food sector. These TRQs enable the EU to export agricultural products at reduced tariffs up to certain amounts. Currently, the EU has about 87 TRQs schemes for agricultural, food and beverage products, including dairy, beef, lamb, poultry meat, sugar, fruit and vegetables, compared to the 54 maintained by the US and 12 by Canada. These TRQs accounted 6 per cent of the EU's agri-food imports in 2014 (Potton and Webb, 2017).

Revell (2017) noted that there are numerous TRQ schemes for meat products, especially for beef and veal. The sheep and goat meat TRQ is simple when compared to the beef and veal. The TRQ for sheep and goat meat is almost 287,000 tonnes, with country-specific allocations, primarily for NZ (228,200 tonnes), followed by Argentina and Australia. Nine TRQs are applied on chicken and turkey. In terms of the dairy sector, the EU has separate TRQs for specific types of cheese, with a total amount of 117,670 tonnes. In case of Brexit, Revell (2017) explained that a simple partitioning of existing TRQs between the EU-27 and the UK is unlikely to resolve the complex issue of access rights of third countries to both markets. He further noted that there is a potential need for reciprocal EU27 – UK TRQs after Brexit. He further suggested that the UK should negotiate its own TRQs with third countries in the long run.

To conclude, a few studies have assessed the potential impact of the UK leaving the EU on the agricultural sector and trade using different scenarios and assumptions. These scenarios include FTA, WTO MFN tariffs, additional NTM at various ranges (trade transaction costs etc.) and UTL (Unilateral Trade Liberalisation). The literature showed mixed results from these studies/ scenarios depending on the assumptions. While some studies projected a positive impact on the UK agricultural sector with increased producer prices across the agricultural commodities (Davis et al, 2017; Jongeneel et al., 2016; Van Berkum, 2016; Sik Choi et al., 2019), other studies projected price drops, especially for the beef and sheepmeat sector (The Andersons Centre, 2019; Davis et al., 2017). In contrast, a Unilateral Trade scenario (i.e. all UK import tariffs drop) showed a significant negative impact on prices, production and incomes across the agricultural sector (Jongeneel et al., 2016; Hubbard et al., 2018). Further, these studies have shown a decrease in bilateral agricultural trade between the UK and the EU with larger impacts on trade patterns in the UK compared to the EU27 but also affecting other EU member states, particularly Ireland (Bellora et al., 2017). In addition, the majority of studies/ scenarios showed a negative impact on the UK's domestic consumption facing higher food prices.

Chapter 4

Trade Modelling, Data and Scenarios

This chapter presents the model and data that was used in this research and introduces scenarios that were simulated.

4.1 Lincoln Trade and Environment Model

The Lincoln Trade and Environmental Model (LTEM) is a multi-country, multi-commodity partial equilibrium modelling framework, which is based on VORSIM the predecessor of SWOPSIM combining associated trade-database used to conduct analyses during the Uruguay Round (Roningen 1986). The LTEM focuses on mapping the trade and production of agricultural commodities worldwide. The LTEM includes 23 agricultural commodities and 24 countries or regions (including the rest of world), which are listed in Table 4.1 and Table 4.2.

Table 4.1: Countries in the LTEM.

Argentina	European Union (28)	Mexico	South Africa
Australia	The United Kingdom	New Zealand	Switzerland
Brazil	India	Norway	United States
Canada	Indonesia	Paraguay	Turkey
Chile	Japan	Russia	Uruguay
China	Republic of Korea	Singapore	Rest of world

Table 4.2: Commodities covered in the LTEM.

Wheat	Oilseed meals	Poultry	Liquid milk
Maize	Vegetable oils	Eggs	Apples
Other grains	Beef & veal	Butter	Kiwifruit
Rice	Pig meat	Cheese	Grapes
Sugar	Sheepmeat	Whole milk powder	Wine
Oilseeds	Wool	Skim milk powder	

In the model, the meat sector consists of sheep meat, beef meat, pig meat and poultry. The dairy sector is disaggregated into five commodities: raw milk (the farm gate product, which is liquid milk), butter, cheese, whole milk powder and skim milk powder. The crop sector has seven products: wheat, sugar, maize, other coarse grains, rice, oil seeds. Further sectors are eggs, wool, kiwifruit and apples, grapes.

The LTEM is applied to quantify the price, supply, demand and net trade effects of trade and agricultural policy changes. The LTEM is a recursive dynamic, thus it provides short-term solutions using a recursive sequence of temporary equilibria year by year in which changes in stock variables are used to connect

two consecutive years. Medium- to long-term policy changes impacts are derived in a comparative static fashion with a base year of 2014 and simulating out by 2030.

4.2 Data

The LTEM is underpinned by a considerable amount of data. This includes country specific producer and consumer prices (in US\$/t), production and consumption quantities (kilotonnes), stocks (kilotonnes), producer and consumer subsidies and taxes, tariffs and quotas (US\$/t). The key exogenous drivers of the LTEM's projections are population data and GDP figures for all represented countries in the model.

In particular, data on tariffs and duties were collected from a number of international database and sources. Trading values and tariffs data are required for the calculation of Brexit scenarios include ad valorem rates. This research collected two sets of data. The first set of data are trading values, which include trading values of exports and import between the EU27 and the UK, trading values of exports from outside of the EU27 to the UK, and to the EU28. The data of trading values were collected from the Eurostat database for 2014.

The second set of data are tariff data, which include Most Favoured Nation (MFN) ad valorem rates for bilateral trade into the EU28, Switzerland, Norway and Turkey. The second set of data also include ad valorem equivalents for the preferential tariffs imposed between the EU28 and Switzerland, the EU28 and Norway; and the EU28 and Turkey. These ad valorem rates were collected from the UNCTAD TRAINS data.

The data for EU28, Switzerland and Norway were collected for 2014.

The tariff rates are given for commodities in the LTEM, which are often aggregates of many narrower classifications of traded agricultural goods. In this research, trade weighted ad valorem rates of each commodity were calculated based on trading values in the base year between the two concerned regions (the EU28 and the UK; the EU28 and outside of EU28; and, the UK and outside of EU28).

The LTEM is a non-bilateral model, which emphasises the net trade of commodities in each country instead of the bilateral trade flows between trading partners. The model treats all traded goods within each commodity as homogenous. Then, in order to simulate limited bilateral trade with specific tariff levels within this model, this research has differentiated commodities into two sub-commodities: one sub-commodity involves products traded between the EU27 and the UK, and the other sub-commodity involves all other trade. To do so, the LTEM model is clearing two markets: the bilateral trade between the EU27 and the UK, and other global trade. This allows for distinct tariff rates for bilateral trade. In addition, the two-commodities are modelled as perfect substitutes both the EU27 and the UK can defer production and consumption for either bilateral trade or global trade, based on the relative trade price. This method of splitting commodities is a similar approach that used in Barkley's study (Barkley, 2002). More importantly, this method has been empirically examined by Saunders et al. (2003), who applied the method to the LTEM, and modelled trade and production between genetically modified agricultural products and non-genetically modified agricultural products in NZ (Saunders et al., 2016).

The method of splitting commodities allows the analysis bilateral trade in a partial equilibrium framework. However, the method is limited in some cases as cross-price elasticities are used to ensure the sub-commodities are perfect substitutes (cross-price elasticity of 1), the relative change between production and consumption of the sub-commodities is relative to the magnitude of production and consumption. A shift in price will have the same proportionate impact on production and consumption between these sub-commodities, thus a differing absolute impact will be observed (Saunders, et al., 2016).

4.3 Scenarios

In this section the baseline and the WTO Scenario are described.

4.3.1 Baseline scenario

This scenario is the pre-Brexit base (baseline scenario) which assumes the UK remains a member of the EU. In this scenario, we assumed free trade between the EU and UK (i.e. tariff and quota free access for UK exports to the EU and vice versa tariff and quota free access for imports into the UK from the EU). In addition, we assumed that the UK would use the same set of tariffs as are applied by the EU to the agricultural commodities imported from third countries (i.e. all countries outside the EU = extra-EU). Table 4.3 presents pre-Brexit trade weighted third country tariffs for the EU and UK.

Table 4.3: Trade weighted third country tariffs for EU and UK in Baseline scenario.

Commodity	EU Trade Weighted Ad Valorem Tariff (%)	UK Trade Weighted Ad Valorem Tariff (%)
Wheat	1.12	1.12
Other Grain	1.04	1.04
Maize	1.00	1.00
Rice	1.10	1.10
Sugar	1.32	1.32
Soyabeans	1.00	1.00
Oilseeds	1.00	1.00
Oilseed Meals	1.00	1.00
Vegetable Oil	1.00	1.00
Beef	1.66	1.66
Pigmeat	1.20	1.20
Sheepmeat	1.46	1.46
Wool	1.00	1.00
Poultry	1.20	1.20
Eggs	1.20	1.20
Raw Milk	1.00	1.00
Liquid Milk	1.00	1.00
Butter	1.55	1.55
Cheese	1.06	1.06
Whole Milk Powder	1.24	1.24
Skim Milk Powder	1.46	1.46
Apples	1.11	1.11
Kiwifruit	1.07	1.07
Grapes	1.01	1.01
Wine	1.06	1.06

Source: the authors' calculation.

4.3.2 WTO Scenario

The WTO scenario assumes that having left the EU in absence of a trade agreement, the UK falls back to the WTO default position with MFN tariffs applied to imports from the EU.

Table 4.4 shows the trade weighted bilateral tariffs which would exist if the MFN tariffs were applied between the UK and the EU. In addition, ten per cent trade transaction costs were applied. Trade transaction costs are non-tariff barriers to trade; they arise from different regulations, border controls, etc. Table 4.5 presents the trade weighted third country tariffs for the EU and the UK. Another assumption in the modelling was the NZ sheepmeat quotas in the EU and the UK were set to fill on average 65kt to the UK, and 109kt to the EU.

In this modelling scenario, the changes in tariffs were assumed to be applied from 2016 onwards for the UK and the EU, while trade policies between all other countries remain unchanged.

Table 4.4: Trade weighted bilateral tariffs between the UK and the EU including 10 per cent trade transaction costs.

Commodity	EU tariffs for imports from the UK	UK tariffs for imports from the EU
Wheat	1.50	1.46
Other Grain	1.51	1.41
Maize	1.10	1.10
Rice	1.37	1.34
Sugar	1.65	1.72
Soyabeans	1.10	1.10
Oilseeds	1.10	1.10
Oilseed Meals	1.10	1.10
Vegetable Oil	1.10	1.10
Beef	1.76	1.77
Pigmeat	1.40	1.40
Sheepmeat	1.58	1.63
Wool	1.10	1.10
Poultry	1.33	1.33
Eggs	1.33	1.33
Raw Milk	1.10	1.10
Liquid Milk	1.10	1.10
Butter	1.70	1.70
Cheese	1.58	1.54
Whole Milk Powder	1.56	1.56
Skim Milk Powder	1.56	1.56
Apples	1.21	1.21
Kiwifruit	1.10	1.10
Grapes	1.17	1.18
Wine	1.19	1.15

Source: the authors' calculation

Table 4.5: Trade weighted third country tariffs for UK and EU.

Commodity	EU tariffs for imports from third countries	UK tariffs for imports from third countries
Wheat	1.50	1.46
Other Grain	1.51	1.41
Maize	1.10	1.10
Rice	1.37	1.34
Sugar	1.65	1.72
Soyabeans	1.10	1.10
Oilseeds	1.10	1.10
Oilseed Meals	1.10	1.10
Vegetable Oil	1.10	1.10
Beef	1.76	1.77
Pigmeat	1.40	1.40
Sheepmeat	1.58	1.63
Wool	1.10	1.10
Poultry	1.33	1.33
Eggs	1.33	1.33
Raw Milk	1.10	1.10
Liquid Milk	1.10	1.10
Butter	1.70	1.70
Cheese	1.58	1.54
Whole Milk Powder	1.56	1.56
Skim Milk Powder	1.56	1.56
Apples	1.21	1.21
Kiwifruit	1.10	1.10
Grapes	1.17	1.18
Wine	1.19	1.15

Source: the authors' calculation

Chapter 5

Results

This section evaluates the results of the WTO scenario described in the previous chapter. Modelling results for the UK, EU and NZ from this scenario are compared to the pre-Brexit base (baseline scenario, the UK remaining in the EU) in 2030.

In this scenario, the UK has applied trade weighted MFN tariffs between the UK and the EU (including 10 per cent trade transaction costs) and trade weighted third country MFN tariffs for the EU and the UK. Results are presented as percentage changes for the production, consumption and trade of crop, meat and dairy commodities for the UK, the EU and NZ (see Table 5.1 to 5.3) in 2030.

As shown in Table 5.1, modelling results indicated a mixed impact on UK producer prices in 2030. Producer prices for most dairy commodities were projected to drop slightly except for cheese which was projected to increase by 21 per cent by 2030. Sheepmeat prices were projected to fall by 5 per cent by 2030 while beef prices were projected to remain unchanged in the same period. Producer prices for crops were projected to increase significantly in this scenario, with sugar and wheat prices projected to increase by 39 per cent and 24 per cent, respectively by 2030.

With regards to the impact on UK production, modelling results showed increases in production for all commodities except sheepmeat. The largest increase in production was projected for cheese (+37 per cent), followed by skim milk powder (+34 per cent), then wheat (+16 per cent).

The changes in producer prices and subsequent change in production obviously affects UK producer returns. Model projections indicated large increases in producer returns for cheese (+66 per cent), sugar (+59 per cent) and wheat (+43 per cent). Projections showed a mixed impact on producer returns from meat. While UK producer returns from beef were projected to basically stay the same (grow by 1 per cent), sheepmeat returns were projected fall by 6 per cent by 2030.

Table 5.1: Impacts of the WTO scenario for agricultural products in the UK, EU and NZ in 2030 (changes to base in 2030).

Commodity		UK		EU		NZ	
		Change (USD/t)	Change (%)	Change (USD/t)	Change (%)	Change (USD/t)	Change (%)
Weighted Average Producer Price compared to base in 2030	Wheat	1,194.85	23.74%	-2.46	-0.82%	-3.15	-0.73%
	Sugar	11,701.89	38.74%	-14.80	-2.01%	-9.48	-1.67%
	Beef	0.63	0.29%	-17.74	-0.34%	0.75	0.02%
	Sheepmeat	-11.34	-4.64%	-10.85	-0.16%	1.67	0.04%
	Butter	-82.90	-1.32%	-17.89	-0.45%	-0.85	-0.02%
	Cheese	1,313.68	21.43%	-60.48	-1.64%	-67.51	-1.31%
	Whole Milk Powder	-409.84	-6.74%	-18.29	-0.57%	5.66	0.13%
	Skim Milk Powder	-609.66	-9.80%	-16.23	-0.60%	-18.31	-0.44%
		Change (kt)	Change (%)	Change (kt)	Change (%)	Change (kt)	Change (%)
Total Production compared to base in 2030	Wheat	3,100.09	15.60%	-341.72	-0.26%	-3.31	-0.63%
	Sugar	1,654.26	14.90%	53.04	0.55%	0.00	0.00%
	Beef	5.39	0.51%	-15.08	-0.18%	0.08	0.01%
	Sheepmeat	-5.61	-1.72%	1.51	0.19%	0.26	0.04%
	Butter	19.46	10.28%	9.07	0.34%	-0.50	-0.08%
	Cheese	178.14	36.92%	-49.28	-0.50%	-1.47	-0.38%
	Whole Milk Powder	0.73	1.43%	3.87	0.52%	-0.04	0.00%
	Skim Milk Powder	25.25	33.95%	-3.96	-0.34%	-0.76	-0.11%
		Change (USD million)	Change (%)	Change (USD million)	Change (%)	Change (USD million)	Change (%)
Total Producer Returns compared to base in 2030	Wheat	43,046.92	43.05%	-429.92	-1.08%	-3.04	-1.36%
	Sugar	199,271.64	59.41%	-104.83	-1.47%	0.00	0.00%
	Beef	1.81	0.81%	-224.89	-0.52%	0.82	0.03%
	Sheepmeat	-5.02	-6.23%	1.58	0.03%	2.21	0.08%
	Butter	105.24	8.83%	-12.27	-0.11%	-3.29	-0.09%
	Cheese	1,959.72	66.27%	-773.63	-2.13%	-33.82	-1.68%
	Whole Milk Powder	-16.71	-5.41%	-1.27	-0.05%	7.56	0.13%
	Skim Milk Powder	96.41	20.43	-29.73	-0.94%	-15.40	-0.55%

In the case of the EU, Table 5.1 shows that if the UK would leave the EU in October 2019 without a deal, EU producer prices were projected to decrease slightly across all commodities by 2030 (except for sheep meat which was projected to remain unchanged). EU producer prices were projected to drop by 1 per

cent for the majority of commodities, except for sugar and cheese prices which were projected to fall by 2 per cent by 2030. EU production of the selected agricultural products were projected to basically stay the same as shown in Table 5.1.

With regards to EU producer returns, for most commodities, these were projected to drop slightly by 2030, except for returns from sheepmeat, butter and whole milk powder which were projected to remain unchanged by 2030.

In the case of NZ, model projections for producer prices indicated no change for most commodities by 2030. Only producer prices from the crops (wheat and sugar) and cheese were projected to drop slightly by 2030, as shown in Table 5.1.

Similarly to the EU production results, modelling projections showed no change in production of the selected agricultural commodities in NZ in 2030. With regards to NZ producer returns, again model projections indicated no change for most commodities by 2030. A slight drop in returns was projected for cheese (-2 per cent), wheat and skim milk powder (-1 per cent, each) by 2030.

Table 5.2: Impacts of WTO scenario for the consumption of agricultural products in the UK, EU and NZ in 2030 (changes to base in 2030).

Commodity		UK		EU		NZ	
		Change (USD/t)	Change (%)	Change (USD/t)	Change (%)	Change (USD/t)	Change (%)
Weighted Average Consumer Price compared to base in 2030	Wheat	787.86	25.66%	-0.73	-0.41%	-3.15	-0.73%
	Sugar	11,079.28	37.41%	-11.53	-1.56%	-9.48	-1.67%
	Beef	13.58	6.52%	19.55	0.38%	0.75	0.02%
	Sheepmeat	1.44	0.58%	100.59	1.50%	1.67	0.04%
	Butter	597.90	9.52%	23.31	0.58%	-0.85	-0.02%
	Cheese	1,618.27	26.96%	-45.39	-1.23%	-67.51	-1.31%
	Whole Milk Powder	1,369.88	19.70%	97.55	3.08%	5.66	0.13%
	Skim Milk Powder	991.10	15.97%	-18.34	-0.68%	-18.31	-0.44%
		Change (Kt)	Change (%)	Change (Kt)	Change (%)	Change (Kt)	Change (%)
Total Consumer Spending compared to base in 2030	Wheat	6,561.01	14.16%	22.25	0.12%	-0.92	-0.55%
	Sugar	11,311.79	15.69%	-67.56	-0.58%	-1.06	-0.84%
	Beef	17.88	6.53%	205.17	0.58%	0.03	0.01%
	Sheepmeat	2.02	2.90%	80.14	1.54%	0.05	0.01%
	Butter	264.39	14.91%	82.40	1.16%	-0.11	-0.02%
	Cheese	908.46	13.71%	-160.04	-0.53%	-3.66	-0.73%
	Whole Milk Powder	28.20	12.64%	49.53	5.05%	0.01	0.06%
	Skim Milk Powder	110.47	25.89%	-18.60	-0.81%	-2.25	-0.26%

Table 5.2 shows modelling results for consumer prices and total consumer spending for the UK, EU and NZ if the UK would leave the EU without a trade deal and introduce MFN tariffs in October 2019. It can be seen that UK consumer prices across all commodities were estimated to grow by 2030. With regards to crops, consumer prices for sugar and wheat were projected to increase by 37 per cent and 26 per cent, respectively. In addition, increases for UK consumer prices for dairy commodities were larger than for meat commodities. Large increases were projected for consumer prices for cheese (+27 per cent) and whole milk powder (+20 per cent). Consumer prices for meat commodities were predicted to increase only slightly; beef prices were projected to grow by 7 per cent by 2030 while sheepmeat prices were estimated to increase by 1 per cent in the same period.

Results on UK consumption were mixed. Consumption was projected to drop for the crops, sugar (-16 per cent) and wheat (-9 per cent). Small consumption changes were projected for meat commodities with sheepmeat projected to increase by 3 per cent and beef consumption was projected to grow by 2 per cent by 2030. UK consumption projections were mixed for the dairy commodities. While decreases were projected for cheese (-13 per cent) and whole milk powder (-12 per cent), consumption of skim milk powder and butter were projected to grow by 28 per cent and 12 per cent, respectively.

The projected increase in consumer prices was predicted to affect UK consumer spending. Across all commodities, consumer spending was projected to increase by 2030. UK consumer spending was projected to increase more for dairy commodities than for meat commodities. The largest increase was projected for skim milk powder (+26 per cent), followed by sugar (+16 per cent), then butter (+15 per cent).

In contrast, if the UK leaves the EU without a deal in October 2019, model projections of consumer prices for the EU were mixed. EU consumer prices for crops were projected to remain unchanged by 2030. With regards to meat commodities, beef prices were projected to increase by 2 per cent while sheepmeat prices were predicted to remain unchanged. Similarly, projections of consumer prices for dairy commodities were mixed. Whole milk powder prices were projected to increase by 3 per cent while butter prices were projected to grow by 1 per cent by 2030. In contrast, consumer prices for skim milk powder and cheese were estimated to fall by 1 per cent, each.

Similarly, results on EU consumption for crops projected a slight increase for wheat and sugar by 1 per cent, each. Consumption of beef was projected to stay the same in 2030 while sheepmeat consumption was projected to increase by 2 per cent. The consumption of dairy commodities was projected to change only for whole milk powder (+ 4 per cent) and butter (+1 per cent).

Similarly, model projections on EU consumer spending indicated mixed results. The largest increase was projected for consumer spending on whole milk powder (+ 5 per cent), followed by sheepmeat (+2 per cent), then butter and beef (+1 per cent, each). In contrast, EU consumer spending for sugar, cheese and skim milk powder was projected to fall by 1 per cent each, by 2030.

Finally, model projections for NZ consumer prices and consumer spending showed that a No Deal scenario would have minimal impact. Results indicated no change in NZ consumer prices for most commodities, except for wheat and cheese (-1 per cent, each) and sugar (-2 per cent). Likewise, in this scenario, NZ consumption was projected to remain the same for most commodities, except for sugar and cheese consumption which were projected to grow by 1 per cent each by 2030. Similarly, NZ consumer spending

was projected to remain unchanged for the majority of agricultural commodities, except for wheat, sugar and cheese where consumer spending was projected to drop by 1 per cent each by 2030.

Table 5.3: Change in net trade in the UK, EU and NZ in kilotonnes in 2030.

	UK			EU			NZ		
	Base	Scenario	Change	Base	Scenario	Change	Base	Scenario	Change
Wheat	4769.7	9248.0	4478.3	28654.4	27760.6	-893.8	-623.8	-630.5	6.6
Sugar	8668.9	10707.2	2038.4	-5988.8	-6091.0	102.2	-222.4	-224.3	1.9
Beef	-265.0	-259.7	-5.3	1544.9	1515.7	-29.1	616.0	616.1	0.1
Sheep-meat	46.4	34.3	-12.1	19.6	20.8	1.2	521.8	522.1	0.3
Butter	-93.0	-87.5	-5.6	910.0	908.9	-1.1	558.2	557.7	-0.5
Cheese	-621.5	-328.1	-293.4	1750.3	1644.4	-105.9	292.5	290.4	-2.0
Whole Milk Powder	19.1	21.8	2.6	439.2	437.1	-2.1	1363.4	1363.4	-0.0
Skim Milk Powder	5.3	24.4	19.1	322.3	319.4	-2.9	464.0	462.9	-1.1

Table 5.3 shows the change in net trade in the UK, EU and NZ in kilotonnes in 2030 if the UK leaves the EU without a deal by 31st of October 2019. Results for UK exports showed an increase across all commodities by 2030, except for sheepmeat. Increases were particularly large for UK exports of wheat and sugar. In the case of UK imports, there was a relatively large fall in cheese imports and smaller falls in beef and butter. In the case of the EU, modelling projections indicated drops for the exports of most exported commodities especially wheat and cheese. EU imports of sugar increased. The EU is still projected to remain a net exporter of all commodities except for sugar. Finally, in the case of NZ, results showed an increase in trade of meat commodities by 2030 while trade in crops and dairy commodities were projected to drop by 2030. The impact on New Zealand is small, and NZ was still projected to remain a net exporter for meat and dairy commodities by 2030.

Chapter 6

Conclusion

On the 31st of October the United Kingdom (UK) is set to leave the European Union (EU). Brexit will change the domestic and trade policies affecting agriculture in the UK and will have implications for global agricultural markets. The trade policy changes are key factors in determining the consequences of Brexit for agricultural markets in Europe and elsewhere.

Several studies have assessed the potential effects of the UK exiting the EU on the UK using different scenarios and assumptions. These scenarios range from soft/ optimistic Brexit scenarios (Swiss Option, Norwegian Option, Unilateral free trade etc.) with new trade tariffs combined with changes in trade transaction costs as non-tariff barriers (with various ranges) to the hard/ pessimistic Brexit scenario (WTO Option/ No deal scenario). However, there is a less research including the analysis of different trade policy options from Brexit on agriculture and the impacts on other countries like New Zealand (NZ).

This study assessed how the agricultural sector in the UK, the EU and NZ would be affected if the UK does not reach a trade agreement with the EU by 31st October 2019, then by default, the UK will have to comply with the WTO rules to trade with the EU, and third countries. Under the WTO rules, all WTO members must follow the MFN principles for goods trade. The UK would lose its tariff-free market access to the EU Single Market if it chose the WTO Option. However, the UK would stop making financial contribution to the EU budget.

In order to assess the potential impact of the scenario that the UK falls back to the WTO default position, a scenario was developed applying trade weighted outbound facing MFN tariffs to imports from the EU and other third countries. In addition, the change in trade facilitation costs was set at 10 per cent. The Lincoln Trade and Environment Model (LTEM), a partial equilibrium trade model that simulates international trade, production and consumption of agricultural commodities was then used for the analysis. The model assessed the impacts of this scenario on the production and consumption of key agricultural commodities for the UK, the EU and NZ by 2030.

Overall, model projections from this scenario showed a significant impact on the UK's consumption and production of crop, meat and dairy commodities from applying WTO tariffs, compared to the UK remaining in the EU (baseline scenario). Modelling results predicted relatively large increases in UK producer returns for crops (ranging from 43 to 59 per cent). Interestingly, projections for producer returns from dairy commodities were mixed with large increases estimated for cheese (+66 per cent) and skim milk powder (+20 per cent) but decreases recorded for returns from whole milk powder (-5 per cent). The projected producer returns for UK meat commodities were mixed.

In case of the EU, results showed slight changes in producer returns from crops, meat and dairy commodities with returns from most commodities predicted to fall by 1 per cent by 2030. In comparison, NZ producer returns from the majority of commodities were estimated to remain unchanged.

With regards to UK consumer spending, projections showed large increases across all examined commodities (ranging from 3 per cent to 26 per cent). In contrast, changes in EU consumer spending were

projected to be minimal. NZ consumer spending was projected to remain unchanged for most commodities by 2030. Results on UK, EU and NZ trade were mixed.

While the UK was projected to experience an increase in exports across all commodities (except for sheepmeat) by 2030, EU trade was projected to decrease for most exported commodities, especially wheat and cheese. Finally, the impact on NZ was small, with minor decreases in world prices for meat and dairy commodities by 2030.

To conclude, the UK's exit from the EU will have a range of implications for other countries like NZ. The nature and extent of its impacts will be determined by the terms under which the UK exits, hence the impact of Brexit is yet unknown. If the UK would leave the EU without a deal and falls back to MFN tariffs in October 2019, this would have a large impact on UK's production and consumption of agricultural goods while the agricultural sector in the EU and NZ would be only slightly affected by this trade policy.

This report is part of a series of discussion documents on the impacts of changes in EU policies that have the potential to affect New Zealand and how these can be discussed and communicated across a number of interested communities. This report is an initial analysis of what the possibilities are and the potential methods to assess this. Clearly, there are a number of further options which can be assessed especially as more detail is released on the future of EU and UK policy.

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Appendix: Literature Review

Table 1.1: MFN Tariffs implemented in WTO default scenario, (Davis et al., 2017).

Products	MFN Tariff
Beef Carcass	12.8% plus €176.89/100 kg
Sheep Carcass	12.8% plus €171.3/100 kg
Pig Carcasses	€53.6/100kg
Chicken Carcasses	€32.5/100kg
Cheese (Cheddar)	€167.1/100kg
Butter	€189.6/100kg
Wheat	€95/100kg
Barley	€93/100kg

Table 1.2: Projected changes in the livestock sectors in the UK, percentage difference in 2025 by scenario (Davis et al., 2017).

	Bespoke UK-EU FTA	WTO Default	Unilateral Trade Liberalisation
Cattle	1%	18%	-42%
Beef cows	0%	6%	-2%
Dairy cows	0%	10%	-14%
Total Cattle	0%	11%	-17%
Beef			
Production	0%	10%	-10%
Domestic use	-1%	-3%	18%
Export	-2%	-100%	-100%
Exports from UK to EU27	-2%	-100%	-100%
Exports from UK to non-EU	-2%	-100%	-100%
Import	-3%	-70%	38%
Imports from EU27 to UK	-3%	-92%	-100%
Imports from non-EU to UK	-3%	94%	1103%
Cattle price	3%	17%	-45%
Sheep			
Ewes	0%	-13%	-12%
Total Sheep	0%	9%	16%
Sheep meat	0%	-73%	-86%
Production	-1%	-83%	-84%
Domestic use	0%	9%	16%
Exports	0%	-73%	-86%
Exports from UK to EU27	-1%	-83%	-84%
Exports from UK to non-EU	0%	-23%	-100%
Import	0%	-17%	-15%
Imports from EU27 to UK	-1%	-100%	-100%
Import from non-EU to UK	0%	-7%	-5%
Sheep meat price	-1%	-30%	-29%
Pig			
Sows	1%	21%	-8%
Total pigs	1%	23%	-8%
Pig meat			
Production	1%	22%	-6%
Domestic use	0%	-6%	5%
Export	0%	-100%	-100%
Exports from UK to EU27	-1%	-100%	-100%
Exports from UK to non-EU	0%	-100%	-100%
Import	-1%	-56%	-9%
Imports from EU27 to UK	-1%	-57%	-31%
Imports from non-EU to UK	0%	0%	7811%

Pig meat reference price	0%	18%	-12%
Poultry			
Production	0%	11%	-3%
Domestic use	0%	-2%	1%
Export	-2%	0%	-43%
Exports from UK to EU27	-2%	-100%	-100%
Exports from UK to Non-EU	0%	408%	189%
Import	-1%	-40%	-8%
Imports from EU27 to UK	-1%	-81%	-100%
Imports from Non-EU to UK	0%	686%	1603%
Chicken price	0%	15%	-9%

Table 1.3: Projected changes in the dairy sectors in the UK, percentage difference in 2025 by scenario compared to the baseline (Davis et al., 2017).

	Bespoke UK-EU FTA	WTO Default	Unilateral Trade Liberalisation
Dairy			
Cow's milk production	0%	7%	-2%
Liquid consumption	0%	-3%	1%
Manufacturing use	1%	18%	-6%
Prices			
Producer milk price	1%	30%	-10%
Cheese price	1%	29%	-11%
Butter price	0%	43%	-11%
WMP price	0%	0%	0%
SMP price	0%	0%	0%
Cheese			
Production	1%	19%	-4%
Domestic use	0%	-4%	2%
Export	-2%	-100%	-88%
Exports from UK to EU27	-3%	-100%	-27%
Exports from UK to Non-EU	0%	-100%	-100%
Import	-2%	-54%	0%
Imports from EU27 to UK	-2%	-55%	-28%
Imports from Non-EU to UK	-13%	-23%	380%
Butter			
Production	0%	25%	-2%
Domestic use	0%	-11%	4%
Export	-4%	-100%	-100%
Export from UK to EU27	-5%	-100%	-100%
Exports from UK to Non-EU	1%	-100%	-100%
Import	-2%	-97%	-26%
Import from EU27 to UK	-2%	-100%	-100%
Imports from Non-EU to UK	-1%	-7%	2558%

Table 1.4: Projected changes in the crop sector sectors in the UK, percentage difference in 2025 by scenario compared to the baseline (Davis et al., 2017).

	Bespoke UK-EU FTA	WTO Default	Unilateral Trade Liberalisation
Wheat			
Production	0%	-1%	-1%
Domestic use	0%	6%	-2%
Export	-3%	-77%	-34%
Export from UK to EU27	-4%	-100%	-100%
Exports from UK to Non-EU	-1%	-25%	166%
Import	-1%	-66%	-62%
Import from EU27 to UK	-1%	-93%	-96%
Imports from Non-EU to UK	-1%	-20%	-6%
Barley			
Production	0%	-1%	-2%
Domestic use	0%	7%	-2%
Export	-3%	-42%	-8%
Exports from UK to EU27	-5%	-78%	-78%
Exports from UK to Non-EU	0%	12%	97%
Import	-3%	-100%	-100%
Imports from EU-27 to UK	-3%	-100%	-100%
Imports from Non-EU to UK	-2%	-100%	-100%
Area			
Wheat	0%	-1%	-1%
Barley	0%	-1%	-1%
Prices			
Wheat	-1%	-4%	-5%
Barley	-1%	-5%	-7%

Table 1.5: Percentage difference in price, production, consumption and trade in Scenario 1 (FTA, 5% trade facilitation costs and a 3% negative price wedge for sheep meat) a) compared to the baseline scenario, 2025 (Van Berkum et al., 2016).

	Soft wheat	Barley	Rapeseeds	Sugar	Beef	Pork	Poultry	Eggs	Sheep	Raw milk	Butter	Cheese	SMP	WMP
Price	5.0	5.0	5.0	4.9	4.6	4.9	4.9	4.5	2.3	4.3	5.0	5.0	4.9	5.5
Production	1.2	1.2	0.1	1.1	1.1	0.7	1.5	-0.8	1.1	1.1	0.1	0.1	18.9	7.8
Use	1.2	0.4	1.8	0.0	-0.1	-0.4	0.0	0.0	2.2		-0.2	-1.1	0.0	0.0
Net exports b)		9.5	-7.4						-48.7				1333.0	
Net imports b)	1.6			-0.6	-17.9	-2.1	-18.2	0.4			-0.6	-2.5		-62.3

Table 1.6: Percentage difference in price, production, consumption and trade in Scenario 2 (WTO default, 8% trade facilitation costs, UK loses access to the EU's preferential import regimes) compared to the baseline scenario, 2025 (Van Berkum et al., 2016).

	Soft wheat	Barley	Rapeseeds	Sugar	Beef	Pork	Poultry	Eggs	Sheep	Raw milk	Butter	Cheese	SMP	WMP
Price	8.0	8.0	8.0	11.5	7.4	7.8	8.1	7.1	8.8	7.2	8.8	8.3	7.8	9.3
Production	2.0	2.0	0.2	2.9	1.5	1.2	2.5	-1.3	6.8	2.0	0.4	-0.2	32.5	13.5
Use	2.1	0.6	2.9	-0.1	-0.1	-0.6	0.2	0.0	-0.8		-0.4	-1.9	0.0	0.0
Net exports a)		16.6	-12.4						326.0				2285.0	
Net imports a)	2.4			-1.5	-26.4	-3.5	-28.9	0.6			-1.4	-4.1		-107.0

Table 1.7: The impact of a UK Trade liberalisation scenario (50% border tariff reduction and 8% trade facilitation costs), in percentage difference in price, production, consumption and trade compared to the baseline scenario, 2025, (Van Berkum et al., 2016).

	Soft wheat	Barley	Rapeseeds	Sugar	Beef	Pork	Poultry	Eggs	Sheep	Raw milk	Butter	Cheese	SMP	WMP
Price	7.9	8.0	8.0	-4.6	-14.9	-3.3	-6.6	8.7	-4.7	2.2	-0.6	3.9	8.0	3.8
Production	1.3	1.3	0.5	-1.9	-6.6	-1.9	-2.5	-1.2	-6.6	-0.7	-1.9	0.5	-2.6	-1.7
Use	-2.3	0.4	2.9	0.0	0.6	-1.7	0.1	0.0	-1.8		0.1	-0.9	0.0	0.0
Net exports a)		10.8	-10.0						-206.0				-181.0	
Net imports a)	-17.2			1.0	106.0	-1.3	29.0	0.5			2.2	-2.7		13.5

Table 1.8: Projected impacts on Beef and Sheepmeat Offal under Brexit Deal (The Andersons Centre, 2019).

	Beef Offal			Sheepmeat Offal			Total Offal		
<i>Measure</i>	<i>Base</i>	<i>Deal</i>	<i>% ch</i>	<i>Base</i>	<i>Deal</i>	<i>% ch</i>	<i>Base</i>	<i>Deal</i>	<i>% ch</i>
UK Production	54.9	55.0	0.2	19.0	18.9	-1.0	73.9	73.8	-0.1
Exports	43.1	43.1	-0.1	6.1	6.1	-0.5	49.3	49.3	-0.1
To EU	21.2	21.0	-0.8	3.5	3.5	-0.8	24.8	24.6	-0.8
To Non-EU	21.9	22.1	0.7	2.6	2.6	0.9	24.5	24.7	0.7
Imports	11.8	11.8	-0.2	7.9	7.9	0.0	19.8	19.8	-0.1
EU	11.8	11.8	-0.2	1.0	1.0	-0.2	12.8	12.8	-0.2
Non-EU	0.1	0.1	0.0	6.9	6.9	0.0	7.0	7.0	0.0
Estimated Consumption	23.6	23.6	0.5	20.8	20.6	-0.9	44.4	44.3	-0.2

Table 1.9: Projected No Deal impacts on Beef and Sheepmeat Offal ('000 Tones) (The Andersons Centre, 2019)

	Beef Offal			Sheepmeat Offal			Total Offal		
<i>Measure</i>	<i>Base</i>	<i>Deal</i>	<i>% ch</i>	<i>Base</i>	<i>Deal</i>	<i>% ch</i>	<i>Base</i>	<i>Deal</i>	<i>% ch</i>
UK Production	54.9	54.9	0.0	19.0	17.3	-9.0	73.9	72.2	-2.3
Exports	43.1	43.5	0.9	6.1	6.2	-0.2	49.3	49.7	0.8
To EU	21.2	19.8	-6.5	3.5	3.6	-0.3	24.8	23.4	-5.6
To Non-EU	21.9	23.7	8.1	2.6	2.6	5.1	24.5	27.3	7.2
Imports	11.8	9.0	-24.2	7.9	7.9	-0.3	19.8	16.9	-14.6
EU	11.8	8.8	-25.0	1.0	1.0	-2.6	12.8	9.8	-23.3
Non-EU	0.1	0.1	166.6	6.9	6.9	0.0	7.0	7.1	1.3
Estimated Consumption	23.6	20.3	-13.8	20.8	19.1	-8.3	44.4	39.4	-11.2